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ABSTRACT

While there is little research specifically dealing with college students and drunk driving, there is ample evidence of frequent, heavy drinking by students. A series of projects was undertaken to explore college students' drinking behavior and attitudes related to alcohol-impaired driving. These projects included: (1) analysis of behavioral observations of 243 students drinking in bars; (2) analysis of behavioral observations of 65 students drinking at a fraternity party; (3) a review of bottled beer consumption by university students; (4) three questionnaire studies of drinking/driving attitudes and behaviors; (5) interviews with six community officials regarding their views of drunk driving and its prevention; and (6) interviews with 26 beer drinkers at the student union. Results indicated that risk taking among drunk drivers was related to the number of passengers and their degree of alcohol impairment. Students' reported movtivation for drinking was personal rather than social. Results also showed that men drink more beer than women in bars, and that both men and women drink more beer when it is served in pitchers. Students were good estimators of their degree of impairment; however, students with blood alcohol content greater than ten percent overwhelmingly underestimated the amount of beer they had drunk. (Numerous tables are included to illustrate the data.) (JAC)

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Exploring the Drinking/Driving Behaviors and Attitudes of College Students

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Exploring the Drinking/Driving Behaviors and Attitudes of College Students

Executive Summary

A series of projects was undertaken to explore college students' drinking behavior and attitudes regarding issues related to alcohol-impaired driving. These projects included: 1) behavioral observations of students drinking in bars; 2) behavioral observations of students drinking at fraternity parties; 3) a review of bottled beer consumption at a university student union; 4) three questionnaire studies of drinking/driving attitudes and behaviors; 5) interviews with six key community officials regarding their view of drunk driving and its prevention; and 6) interviews of beer drinkers at the university student union.

The naturalistic observations in tavern and party settings revealed instructive and intriguing environment-behavior relationships; some of the more remarkable results were:

- Beer drinking in bar-room settings occurred at approximately one ounce per minute for male university students.
- Co-eds drank significantly less beer than males (at about .5 oz per min.), and they stayed in a particular bar for significantly longer periods of time than males.
- Individuals drank significantly more beer when drinking in groups (rather than alone) and when purchasing beer in pitchers (compared to cups, glasses, or bottles).
- Students at fraternity parties were extremely receptive to receiving feedback on their blood alcohol concentration (BAC), and accuracy of subjective BAC estimates was an inverse function of actual BAC.
- The intervals between party <u>arrival</u> and <u>first</u> beer (starting time) and between party <u>departure</u> and <u>last</u> beer (sobering time) varied inversely with an individual's BAC measured at the end of the party.

Overview of the Drinking and Driving Problem

The prevention and control of driving under the influence of alcohol (DUI) has been a significant societal concern almost from the inception of the automobile (U.S. Department of Transportation, 1968). Jones and Joscelyn (1978), in their review of the drunk-driving literature, estimated that between 40% and 55% of all individuals involved in fatal traffic accidents had blood alcohol concentrations (BAC) exceeding .10%, the legal limit in most states. In terms of actual casualties, it is estimated that more than 25,000 people per year are killed and an additional 650,000 are injured as a result of alcohol-impaired driving (Jones & Joscelyn, 1978). Furthermore, the estimated annual cost of this problem approaches 24 billion dollars (Peck, 1982). To put these figures into perspective, the number of individuals injured or killed annually as a result of alcohol-impaired driving would populate a city approximately the size of San Diego; and the yearly loss of capital is roughly equivalent to the gross national product of South Korea.

In Virginia, drinking drivers were involved in about 36.2% of the 907 fatal accidents in Virginia in 1981. Forty-three percent of these accidents involved drivers between the ages of 18 and 24. Additionally, drinking pedestrians accounted for 17.1% of the 2107 pedestrian accidents and 25.3% of the 158 fatal pedestrian accidents in 1981 (Virginia Department of State Police, 1981).

Blacksburg, the site of the present study, is located in Montgomery County, Virginia. When Virginia's 95 counties are ranked according to deaths per 100 million vehicle miles traveled, Montgomery County ranks seventh. While Blacksburg itself had three traffic fatalities in 1981, it is not known whether these involved drinking drivers (Virginia Department of State Police, 1981).

Definition

In Virginia, as in most states, the legal definition DUI is based upon a blood alcohol concentration (BAC) of .10%, or .01 grams of alcohol per 100 milliliters of blood. A driver's BAC may be determined from a blood sample taken by qualified medical personnel, or by taking a blood sample and analyzing it on the Smith and Wesson Breathalyzer. In the case of blood samples, two vials are collected and analyzed immediately. One is analyzed by the Commonwealth in Richmond and the other is analyzed by a laboratory of the defendant's choosing (Code of Virginia, 1982).

In Virginia, a BAC of .10% constitutes strong evidence of driving under the influence. However, if a defendant's BAC is at least .05% but less than .10%, he/she may still be charged with DUI, but some further evidence of impairment (e.g., the result of psychomotor tests, involvement in an accident, etc.) will be necessary to obtain a conviction. A BAC reading of less than .05% constitutes insufficient evidence for a charge of DUI. Under the Implied Consent Law, a driver is assumed to have tacitly given his consent to take a test for blood alcohol at a police officer's request when the driver accepted his license to operate a motor vehicle (Code of Virginia, 1982).

The .10% legal BAC limit was not established arbitrarily. Hurst (1970) demonstrated that the relative probability of crash involvement begins to increase at a BAC of .05%, and is about 10 times as great at .10% than it is at blood alcohol concentrations below .05%. These estimates were supported by Farris, Malone, and Lilliefors (1976) in their Huntsville, Alabama study. Hurst (1974) estimated that if all crashes involving drivers with BAC's of .10% and greater were eliminated, six billion dollars could have been saved in costs to society. A further two billion dollars could have been saved if accidents involving BAC's above .05% were eliminated.

Interestingly, Hurst (1974) found a strong negative correlation between accident risk and frequency of drinking. Daily drinkers showed the lowest probability of accident involvement, followed by weekly drinkers, three times per week drinkers, monthly drinkers, and yearly drinkers, respectively. Daily drinkers were found to be no more crash prone at .08% BAC than drivers, in general, at zero BAC. However, above .08% BAC, the risk of accidents increased sharply for daily drinkers. This suggests that at lower BAC's, experienced drinkers and drivers may be compensating for alcohol impairment.

Characteristics of Drinking Drivers

In looking at American drinking patterns, Cahalan, Cisin, and Crossley (1969) found that abstainers constituted 32% of all respondents, infrequent drinkers 15%, light drinkers 28%, moderate drinkers 13%, and heavy drinkers 12%. These categories were based upon self-reports of drinking frequency, with the amount of alcohol consumption being expressed in number of drinks. Additionally, these researchers found the following factors to be associated with higher levels of alcohol consumption: male gender, youth, higher socio-economic status, city residence, higher levels of education, and drinking at home with friends.

Jones and Joscelyn (1978), in their comprehensive review of the DUI literature, have identified several variables which are related to drunk driving, including: gender, age, marital status, time of day, day of the week, and previous DUI convictions.

Gender

Males tend to be overrepresented in all types of motor-vehicle accidents. The National Safety Council (1976) estimated that 55% of all registered drivers were male, that 83% of fatal accidents involved male drivers, and that 70% of all vehicle crashes involved male drivers. In their California study,

Waller, King, Nielson, and Turkel (1970) found 86% of fatally injured drivers to be males, while Filkins, Clark, Rosenblatt, Carlson, Kerlan, and Manson (1970) found 90% male fatalities in their Wayne County, Michigan study. In addition, according to both of these studies, 90% of fatally injured drivers who had been drinking were male. Farris et al. (1976) found 81% of fatal DUI's to be male, and Borkenstein, Crowther, Shumate, Ziel, and Zylman (1964) found 88% of drinking drivers to be male in their Grand Rapids study.

Roadside surveys conducted in Vermont (i.e., Perrine, Waller, & Harris, 1971), Grand Rapids, Michigan (i.e., Borkenstein et al., 1964), and the National Roadside Survey (i.e., Wolfe, 1975) found that 83%, 95%, and 91% of the male drivers had BAC's greater than or equal to .10%, respectively. Jones and Joscelyn (1978) concluded that the male over-representation in DUI-related accidents does not indicate that drinking males have poorer driving abilities than drinking females. Instead, because males account for a large percentage of the total miles driven in this country, they are much more likely than females to drive after drinking.

Age

Generally, it can be said that different age groups face different risks of having an alcohol-related crash. Most of the major studies which have examined the age variable in relation to DUI, have found that among the youngest (under 20) and oldest (over 60) age groups, crash involved drivers were less likely to be drinking or drunk than drivers as a whole (Borkenstein et al. 1964; Cosper & Mozensky, 1968; Farris, Malone, & Lilliefors, 1976; Filkins et al., 1970; Perrine, Waller, & Harris, 1971). However, reliable data indicate that the risk of an accident after any drinking is highest for younger drivers. On the other hand, at high BAC levels older drivers have the highest risk of a vehicle crash (Jones & Joscelyn, 1978).

The high susceptibility of accidents among youth after drinking is particularly significant in light of the fact that traffic accidents represent the single largest cause of death among youth (Filkins et al.,1970). Specifically, the National Safety Council (1979) reported that 11,500 traffic fatalities in 1979 involved a driver under 20.

Marital Status and Other Demographic Variables

Some evidence exists suggesting that separated and divorced drivers are more likely to drink and drive than drivers of any other marital status (Borkenstein et al., 1964). However, since it is difficult to analyze the interaction of marital status and age in the studies conducted to date, no firm conclusions can be drawn regarding the effects of marital status on DUI accidents and fatalities (Jones & Joscelyn, 1978).

Occupation, race, education, annual income, and religion have not been demonstrated to be reliably associated with DUI fatalities. However, rural drivers tend to have higher BAC's than urban drivers (Jones & Joscelyn, 1978).

Time of Day.

Several studies have examined time of day and its relationship to DUI (e.g., Farris, Malone, & Lilliefors, 1976; Filkins, et al., 1970; Lucas, Kalow, McColl, Griffith, & Smith, 1955; Waller et al., 1970; Zylman, 1968). Summarizing across studies, the period from 9:00 p.m. to 6:00 a.m. seems to represent the greatest drunk-driving hazard. This is not surprising given that this is the time when individuals are most likely to have been drinking (Filkins et al., 1970).

Day of Week

The data typically show that more alcohol-related fatalities occur on Friday, Saturday, and Sunday than on weekdays, due to increased alcohol consumption during the weekend. This effect was clearly demonstrated by

Filkins et al. (1970) in the Wayne County, Michigan study, where 65% to 75% of all drivers fatally injured on weekends had BAC's of .05% or greater, compared with 50% of the weekday traffic fatalities.

Previous Convictions

Filkins et al. (1970), and Sterling-Smith (1976) showed that previous traffic arrests, particularly DUI arrests, were highly associated with future DUI behavior. Filkins et al. (1970) showed that 82% of fatally injured drivers with BAC's of at least .10% had been previously convicted of at least one traffic violation, compared with 66% of those having BAC's below .10%. In Boston, Sterling-Smith (1976) found 39% of drivers in alcohol-related accidents to have a previous conviction for DUI or public drunkenness, compared to 24% of drivers involved in non-alcohol-related crashes.

Other Moderating Variables

While Wolfe (1975) concluded that miles driven was not a reliable discriminator between drinking and non-drinking drivers, Borkenstein et al. (1964) reported that among drivers who drive 5,000 miles per year or less, drinking drivers travel consistently fewer miles. Wolfe (1975) demonstrated to no one's surprise, that drivers leaving bars are reliably more likely to be driving while intoxicated than those driving from home, work, or a sports facility.

Alcohol Consumption

Amount and Frequency

Contrary to expectation, Borkenstein et al. (1964) showed that crash-involved drivers tend to drink less frequently than non-crash-involved drivers. The BAC's of crash-involved drivers were higher than those of non-crash-involved drivers, however, it should be noted that any conclusions to be drawn from the frequency of drinking data must be tempered by the fact that

these are either self-report data, or anecdotal reports by family or friends of the subject. Therefore, the possibility exists that crash-involved drivers could minimize their drinking histories, for obvious reasons.

Borkenstein et al. (1964) raised the prospect that drinking experience, or perhaps alcohol tolerance, has some palliative effect with respect to accident risk. This conclusion stemmed from the observation that among drivers with moderate BAC levels (i.e., .05% to .07%), crash probabilities were lower for drivers who drank relatively more frequently. Hurst (1974) confirmed this effect, and found it to hold for drivers with BAC's less than .10%. Further evidence of the relationship between drinking history and DUI shows that of fatally-injured Boston drivers found to be at fault for their accidents, 39% drank daily, 38% drank weekly, and 8% were abstainers (Sterling-Smith, 1976).

Preferred Alcoholic Beverage

Studies consistently show beer to be the preferred beverage among all consumers of alcoholic substances, including drunk drivers (e.g., Borkenstein, 1964; Engs, 1977).

Other Moderating Factors

The place where one drinks has been found to influence DUI probability. Borkenstein et al. (1964) and Perrine, Waller, and Harris (1971) reported that two thirds of their samples drank at home; and Borkenstein et al. indicated that crash-involved drivers were slightly more likely to drink at home than non-crash-involved drivers.

Furthermore, Jones and Joscelyn (1978) showed that drivers with severe alcohol problems are over-represented in alcohol-related crashes, but the degree of this over-representation cannot be reliably estimated from data gathered thus far.

Research with College Students

While there is virtually no research which deals specifically with the college population and the incidence of DUI, there is ample evidence that college students tend to be frequent and heavy users of alcohol. In a relevant but dated survey, Gusfield (1961) studied beer consumption in a sample of 185 men from a small Eastern liberal arts college. Even then, only 3% of the sample was classified as abstainers.

Several interesting relationships became apparent when the sample was divided into "high user" (reported drinking beer twice a week or more) and "low user" groups (reported drinking beer less than twice a week). A significant relationship was found between religious affiliation and high use of alcohol, with 63% of Protestants, 66% of Catholics, but only 29% of Jews classified as high users of beer. Fraternity membership was a significant predictor of high beer consumption, with 60% of fraternity members being classified as high users. Within fraternities, a sociogram study revealed that high users had more close friends in the same fraternity than did infrequent drinkers (Gusfield, 1961). Also, those students in the high alcohol group more frequently had parents who were adjudged to be high users ($p < .01$).

Other survey studies reveal high rates of college drinking. For example, Engs (1971) surveyed 1000 students in 13 colleges and found that 78% drank at least once a year. Penn (1974) reported occasional use of alcohol in 95% of his sample; Milman & Su (1973) reported 91% occasional usage; and Hanson (1977) found that 83% occasionally drank. Hanson (1974, 1977) and Wechsler and McFadden (1976) reported a trend toward more equal drinking rates between men and women, although men still drink more.

A questionnaire study by Banks and Smith (1980) found that college

students generally believed that their drinking decisions were made independently of the influence of their peers or their environment. This reinforced an earlier finding of Heubner, Slaughter, Goldman and Caddy (1976) that heavy drinkers more strongly endorsed individual freedom to decide how much to drink.

Banks and Smith (1980) classified college student drinkers into light, moderate, moderate-to-heavy, and heavy categories. Heavy drinkers were those who drank several times per week or more than six drinks every weekend. Moderate to heavy drinkers were those reporting three to six drinks per week or more. Moderate drinkers drank no more frequently than every weekend, or drank every weekend but no more than two drinks at a sitting. Light drinkers were those who reported drinking once per month or less, and never consumed more than two drinks at a time. By these criteria, 20% of the students were heavy drinkers, 30% moderate to heavy, 25% moderate, and 25% light drinkers. When asked to compare their drinking to that of their friends, heavy drinkers said they drank about as much as their friends, while light drinkers estimated that they drank less than their friends. Most students denied that peer pressure played any part in their drinking.

Igra and Moos (1979) conducted a longitudinal study with college students to test the relationship between alcohol use and five factors: the drinking context of the dormitory living group, formal involvement in college activities, informal social involvement in college, commitment to religious and academic values, and psychological stress. They found that the drinking context of the dormitory living group, informal social involvement in college, and lack of commitment to religious and academic values were predictors of alcohol use. Neither formal involvement in college activities nor psychological stress had any effect upon drinking.

While the studies mentioned thus far provide some information about the drinking habits of college students, Kessler and Gomberg (1974) cogently pointed out that most studies of drinking practices have applied indirect measures of drinking, such as surveys and interviews. Unfortunately, there has been no attempt to corroborate these self-reports. Furthermore, when laboratory experiments have been conducted, the subjects have usually been alcoholics, and nonrepresentative of the general drinking population. In response to these shortcomings, Kessler and Gomberg observed drinking in a bar setting and found that it was possible to reliably and unobtrusively observe drinking behavior *in vivo*. Similar field observation studies were conducted by Cutler and Storm (1975), Reid (1978), and Rosenbluth, Nathan, and Lawson (1978). Rosenbluth *et al.* conducted behavioral observations in a college pub and enumerated components of the drinking behavior of randomly chosen subjects over a one hour period. Dependent variables consisted of number of sips per glass of beer and number of glasses consumed in the one hour period. Males were found to drink significantly more than females, and drinkers of both sexes drank more in dyads than in groups of three or more. Males also drank faster than females, and drinkers in groups drank faster than drinkers in dyads.

Interventions Applied to Drunk Driving

Korenbaum (1982) stressed the importance of understanding prevention efforts in terms of the public health conception of prevention. When applied to diseases in general, prevention is an all-embracing concept, composed of three parts: primary prevention, secondary prevention, and tertiary prevention. Primary prevention refers to actions which take place prior to the onset of the disease to prevent or alter its course. Secondary prevention refers to early diagnosis and treatment. Tertiary prevention deals with

rehabilitation. Drunk driving countermeasures can be viewed similarly.

Primary prevention efforts in drunk driving would be directed toward keeping the drinker from operating a motor vehicle. Secondary prevention efforts are those aimed at the apprehension of the drunk driver while he is driving, and tertiary prevention refers to rehabilitation of the drunk driver through programs like the Alcohol Safety Action Program (ASAP).

Korenbaum (1982) emphasized the need for primary prevention efforts when he argued that:

> The emphasis on enforcement (aimed at getting the driver, once drunk, off the road) and rehabilitation (aimed at treating both DUI offender and the problem-drinking driver) over primary prevention (aimed at preventing the alcohol-impaired driver from driving) may well have contributed to the fact that current countermeasures have, by-and-large, failed to reduce alcohol-related collisions...thoughtful analyses such as Lane's (1979) suggest that sheer numbers of drinking drivers may mitigate attempts to deal with the problem at levels beyond primary prevention. Detection rates are sufficiently low to conclude that enforcement efforts have not made significant impact on the drinking-driver problem. If a ten-fold increase in detection rates were to occur, there would still be about 100-200 times that number of drinking drivers on the road. Since both enforcement and rehabilitation efforts are highly dependent on detection rates, it is clear that increased attention to effective primary prevention strategies can only have a salutary effect (pp. 8, 9).

Secondary Prevention (Enforcement)

That secondary prevention is fraught with difficulties becomes apparent when past enforcement efforts are examined. Several studies have been conducted to determine the effects of increased enforcement efforts upon the incidence of DUI. Perhaps the most well-known of these was the "Cheshire Blitz" of 1976, which was conducted in the county of Cheshire, England (cited in Ross, 1982). The Chief of Police for the County of Cheshire, concerned with an apparent reduction in the deterrent effect of the Road Traffic Act of 1972, ordered his officers to go as far as they could, within the letter of the law, to administer the breathalyzer test to as many people as possible who were driving between 10 p.m. and 2 a.m. This period was later expanded to

cover the interval between 9 p.m. and 4 a.m. Immediately, police administered 10 or 11 times the number of tests and arrested twice the number of people with high BAC's. This policy resulted in a significant decrease in serious accidents within the County. Ross (1982) pointed out, however, that the blitz attracted a good deal of unwanted publicity, and the positive effects were not maintained after the program was stopped. Chief Kelsall, a participant in the "Blitz" campaign, also reported that pub business declined significantly during the period of the blitz (Kelsall, 1982). In itself, this could account for the decline in accidents, which was probably more a result of the publicity than of the actual enforcement.

A similar stepped-up enforcement program in New Zealand had comparable effects, including the accompanying negative publicity. There was a drop in serious alcohol-related accidents, but a recovery of baseline rates occurred after the crackdown ended (Ross, 1982).

In Australia, a law was passed permitting random roadblocks for the purpose of breath testing. When this was coupled with increased enforcement efforts, Ross (1982) reported an increase in the perceived risk of apprehension when compared with perception of risk of apprehension for speeding (the control condition). However, data were not collected after the period of increased enforcement, so the long term effects of the program could not be evaluated. In a summary statement about the effectiveness of increased enforcement campaigns, Ross (1982) concluded that:

> Both the laws and enforcement campaigns are found to be effective, but only in the short run. The effects of the laws are found to diminish over time, and the enforcement campaigns have been terminated with no evidence of post-termination effects (p.90).

In the United States, there are obstacles to the "crackdown" type of intervention, particularly where roadblocks are employed. The American Civil Liberties Union holds that the Fourth Ammendment requires police officers to

have probable cause to suspect that a crime has either been committed, or is in the process of being committed, before an individual can be stopped. The roadblock procedure is, therefore, considered to be a dangerous broadening of police search and seizure powers (Spitser, 1982). However, Captain John Baker, who introduced the roadblock sobriety checkpoint system in Montgomery County, Maryland, presented an alternate view at the 1982 International Symposium on Alcohol and Driving (Baker, 1982). Captain Baker indicated that the beneficial deterrent effects generated by such a system outweigh potential drawbacks, as long as the police officers are competent (Baker, 1982).

In sum, it may be said that while evidence exists that police crackdowns, particularly if accompanied by large-scale publicity, do have some salutary effects, long-term benefits have not been demonstrated. The costs of maintaining a state of DUI hyper-vigilance are prohibitive for most jurisdictions, and in the absence of a demonstrated long-term effect, it is doubtful that crackdowns are the most efficient way to proceed. Beyond this, the Fourth Amendment considerations hinder many potential cost-efficient procedures like the roadblock.

An interesting modification of increased police enforcement has been implemented in Maryland. The Maryland Citizen's Report Drunk Driving Program began on January 1, 1983, with the aim of the program being to increase DUI arrests by encouraging citizens to report drunk drivers to police. As of July 4, 1983 the Maryland State Police had received 9134 citizen's reports, had made 3,348 contacts, and arrested 1,251 drunk drivers (R. L. T. Swope, personal communication, August 13, 1983). While this figure is encouraging, it has not been determined whether overall DUI arrests (independent police action plus Citizen's Report Program) have increased. The cost effectiveness of pursuing a large number of citizen reports is also open to question.

Tertiary Prevention (Adjudication)

Jones and Joscelyn (1978) cited three main decision points affecting the imposition of prescribed DUI punishments:

- The decision to charge a driver with DUI when there is strong evidence that such a violation did occur,
- The decision to render a guilty verdict against an individual who, by legal standards, is guilty, and
- The decision to apply a prescribed punishment against the guilty party.

As a case manager for the Virginia Alcohol Safety Action Program, one project manager (i.e., Altomari) has observed that the major sticking point in the system occurs with the third item described above: very few persons who are convicted of DUI receive anything approaching the maximum penalty allowed under the law. This has been true in Southwest Virginia, despite an increased public awareness of the DUI problem, and the implementation of a stricter DUI statute in July of 1982.

This state of affairs parallels the effects of the "Chicago Crackdown" which began around Christmas of 1970. At that time, Chicago Judge Raymond Berg, supervising judge of Chicago's traffic court, decreed that for the subsequent six-month period, all persons convicted of DUI would receive an automatic seven-day jail sentence. While more than 6,600 drivers were arrested for DUI during this time, only 557 (i.e., less than 10%) received the prescribed seven-day jail term (Ross, 1982).

Newman, Dirnberg, and Rivo (1971) have documented instances across New York State jurisdictions of low (17.6%) conviction rates after trial, while another 17.7% plead guilty. Furthermore, 27% of those arrested for DUI were never prosecuted for DUI or any other offense.

Joscelyn and Jones (1971) reported case studies in two jurisdictions which showed that nearly all of those arrested for DUI were subsequently

prosecuted, and more than half were found guilty. However, fines imposed were near the low end of the scale; and jail sentences, when they were imposed, averaged ten days per conviction. License suspensions averaged nine months.

It also seems that aggressive DUI enforcement triggers aggressive DUI defense. In response to tougher DUI laws, the Virginia Law Foundation and the Criminal Law Section of the Virginia State Bar have compiled a booklet entitled Defense of Drunk Driving Cases, which is a technical manual emphasizing the loopholes in the DUI law (Virginia Law Foundation, 1982). Several cases have been delayed while the Smith & Wesson breathalyzer was tested in Virginia to determine whether radio waves affect the reliability of the mechanism; and in Montgomery County, Virginia, several DUI cases were dismissed when the presiding judge decided that defendants should be taken to the magistrate's office prior to blood or breath testing, contrary to common practice (P. Keith, Personal Communication, June 30, 1983).

Thus, it appears that the low probability of apprehension, conviction, and the lack of strict sentencing all undermine the deterrent effect of legal interventions. Moreover, there is ample evidence to suggest that punishment is not the ideal tool to use for influencing long term behavior change. By their nature, the suppressive effects of punishment imply that the drinking person would probably drive in the absence of the punishing agent. Punishment effects are transitory, and the DUI literature bears this out (as reviewed by Ross, 1982). Moreover, there are frequently unwanted side effects associated with the punishing agent which could have a deleterious effect upon the individual's willingness to cooperate with law enforcement agencies in the future.

Another tertiary intervention, the Alcohol Safety Action Program (ASAP), was established by the National Highway Traffic Safety Administration (NHTSA)

in the early 1970's. The program's goals were to increase the number of arrests and convictions of drunk drivers by educating police and members of the judicial system, and to provide support to police departments in the form of relevant literature and recognition. Furthermore, the ASAP provided an alternative means of sentencing DUI violators. In some jurisdictions a referral to ASAP will stand in lieu of a conviction; in all cases, participation in ASAP serves to obviate harsher penalties.

The ASAP program typically provides educational or quasi-therapeutic group experiences to DUI violators in the hope that alcohol information will alter attitudes and result in behavior change. However, while evidence exists that attitude changes occur, ASAP effects seem to fall short of behavior change. For example, Ellingstad (1976) and Nichols (1977) have shown that ASAP programs tend to influence beneficial knowledge and attitude changes in their clientele, but seem to have little effect upon accident involvement, re-arrest rate, or life changes. Similarly, the conclusions from the National Highway Traffic Safety Administration (NHTSA) on the effectiveness of ASAP rehabilitation programs was that, while some positive impact might occur, no firm evidence regarding an effective reduction in re-arrests or crash involvement could be found (U.S. Department of Transportation, 1975, Chapter 5). However, Hans Klette, speaking at the International Symposium on Alcohol and Driving (1982), claimed that over a period of approximately 40 years, the public information and education approach in Sweden has been generally effective in reducing alcohol-related accidents, except among those with "drinking problems" and among young males.

In general, the effectiveness of public information and education approaches seems to be small when evaluated in terms of reduction in accident rates. Geller, Winett, and Everett (1982) maintain that educational

approaches are generally inefficient effectors of behavior change when used alone, although they may sometimes facilitate changes in behavior when included in a package with other intervention strategies.

Primary Prevention

Ross (1982) categorized primary prevention as general deterrence. General deterrence refers to the social learning effect of enforcement measures upon the populace at large. This can be thought of as the degree to which legal measures prevent individuals from DWI through the process of observing the consequences meted out to others for breaking the law. Behaviorists refer to this particular behavior change strategy as vicarious punishment (Bandura, 1969).

In his review of the deterrence literature, Ross (1982) specified three critical components of the deterrence model: the perceived certainty, severity, and celebrity of punishment. To the extent that each of these elements is maximized, the general deterrent effect of a law is maximized. Thus, as previously discussed, the low probability of apprehension, conviction, and lack of strict sentencing (Jones & Joscelyn, 1978) all undermine the deterrent effect of legal interventions aimed reducing DWI.

Laws which focus on primary prevention have fared better than enforcement countermeasures. Wagenaar (1982) analyzed automotive crash data for Michigan, Maine, New York and Pennsylvania for the 1972-1979 period to determine how changes in minimum drinking age laws influenced the accident rate for young drivers. In general it was found that a decrease of approximately 20% occurred in the accident rate when the minimum drinking age was raised in Maine in 1977, and Michigan in 1978. No changes occurred in the states where the drinking age remained constant (i.e., New York and Pennsylvania).

Researchers at the Insurance Institute for Highway Safety indicated that in the period between 1976 and 1981, 14 states raised the minimum legal drinking age. As a result of this change, it is estimated that approximately 380 fewer young drivers have been involved in nighttime fatal crashes each year in these 14 states as a result of this action. These Insurance Institute researchers concluded that "any single state that raises its drinking age can expect the involvement in nighttime fatal crashes of the affected age groups to drop by about 28 percent" (Insurance Institute for Highway Safety, 1981). Conversely, Whitehead, Craig, Langford, MacArthur, Stanton, and Ferrance (1975) reported that after reducing the minimum legal drinking age from 21 to 18 in London, Ontario, Canada, the number of collisions involving young male drivers increased by approximately 24%. These strikingly different results may, in part, be due to differences in Canadian and American youth, as well as the fact that the youth in Canada may have travelled to other provinces to obtain their liquor.

Another body of laws which may have a primary prevention effect are termed "Dram Shop Acts". These laws were introduced in the mid-1800's in the United States, and held that tavern owners were responsible for the support of families of patrons who had become "habitual drunkards" (Mosher, 1979). Although dram shop suits were relatively rare until after the repeal of Prohibition, dram shop suits had become common by the 1950's. Even in states without dram shop acts per se, suits were initiated. For example, in 1954 New Jersey by-passed the state legislature and imposed third party liability through common law.

To establish a valid claim against a bar owner or other third party, two elements of proof are necessary. First, it must be established that the server of alcoholic beverages has a duty to protect the plaintiff from harm.

Secondly, it must be demonstrated that the server failed to meet this duty. Usually, liability is limited to commercial vendors of alcoholic beverages, although a few courts have infrequently imposed a similar duty upon social hosts (Mosher, 1979). In spite of its infrequent use, dram shop suits could provide a useful lever in the campaign against DUI. However, stricter definitions are needed to specify what constitutes "reasonable care" on the part of both commercial alcohol vendors and social hosts (Mosher, 1979).

Community-based primary prevention efforts have generally evolved from grass roots movements against drunk driving. Chief among these are Mothers Against Drunk Drivers (MADD), founded by Candy Lightner after the loss of her child in a drunk driving accident. MADD and it's counterparts like Many Against Drunk Drivers, Students Against Drunk Drivers (SADD), and Truckers Against Drunk Drivers (TADD) have been responsible for many innovative and potentially effective DUI interventions. For example, MADD places members in courts to monitor the legal treatment of DUI offenders. It has provided "drive the drunk home" projects in some major cities during the Christmas holiday season (e.g., Los Angeles in 1981). SADD has been instrumental in developing and disseminating a contracting program between parents and children, wherein each promises the other to provide rides after drinking, with no questions asked until the next day (Starr, Cook, Zabarsky, Contreras, & Foote, 1982).

While these ad hoc programs may be providing some primary prevention effect, there are some problems with them. First, they are not evaluated systematically, and thus, their net impact is unknown. Perhaps this lack of evaluation and documentation is forgivable, since these are non-scientific organizations whose members are fulfilling their own needs while trying to do something beneficial for society. A larger problem with these programs,

however, is that they are frequently not coordinated with similar programs sponsored by other organizations. The net result is that the public support which is so essential to the success of any plan to reduce DUI is being fragmented and dissipated among several competing programs. Indeed, this fractionation of programs could cause the public to become immune or even hostile to future requests for support (H. Mendelsohn, personal communication, November 18, 1982).

Conclusions

Most of the major researchers in the field of drunk driving agree that there are no practical, sweeping solutions to the DUI problem (c.f. Ross, 1982). However, there are some guidelines which should be followed when searching for a solution. For example, community-based primary prevention interventions may be most effective and cost efficient DUI programs in the long run. For this strategy to be effective, a method for monitoring changes in DUI behavior must be developed, as dependent variables such as accident rates, fatalities, and perhaps even DUI arrests may not be sensitive enough to detect changes in the incidence of DUI in a small community environment.

Purpose of this Research

The general purpose of this research was to develop a knowledge base for constructing a workable program to reduce DUI among a college student population within a small community. The specific objectives were: a) to assess drinking and driving attitudes and behaviors in the target population at Virginia Polytechnic Institute and State University; b) to assess the availability of local resources for tackling the DUI problem, and c) to develop guidelines for a community-based intervention plan. A number of components were designed in pursuit of these goals.

A. To assess student opinions, and attitudes, the following instruments

were developed:

1. A multiple-choice questionnaire designed to obtain objective opinion and attitude information about the way students regard drinking, driving, and other alcohol-related topics.
2. An open-ended questionnaire in the form of a structured interview, intended to obtain accounts of actual traffic incidents associated with alcohol.
3. An open-endad questionnaire which allowed respondents to state their attitudes about DUI behavior in the form of advice to a hypothetical foreign exchange student.

B. To assess the drinking and driving problem in vivo, the following projects were undertaken:

1. Drinking data were collected by direct observation of patrons in community bars.
2. Drinking data were collected at a campus fraternity party. In addition, the feasibility of employing portable breath alcohol analysis instruments to inform party-goers of their level of impairment was explored, and the ability of party-goers to estimate their own level of impairment was assessed.
3. A study of bottled beer consumption at Squires Student Center on the campus of Virginia Polytechnic Institute and State University was conducted to examine trends over a two year period.

C. To determine the availability of community support and resources, two minor projects were undertaken:

1. Interviews with the key administrative personnel in the community and on the Virginia Tech campus were conducted to determine their degree of awareness of the problem, their willingness to support an intervention

effort, and to solicit their ideas on reducing its occurrence.

2. The researchers attended an alcohol fair entitled "Take A.I.M." (Alcohol In Moderation) and polled participants to assess their willingness to participate in a particular drunk driving intervention on a volunteer basis.
3. Interviews at Squires Student Center were conducted to assess the opinions of *bona fide* beer drinkers about issues related to the beer consumption observations, such as, why they chose to drink beer by the pitcher rather than bottle or glass.

Method

Drinking and Driving Experience Questionnaire

A questionnaire was devised in a structured interview format in order to acquire open-ended data about experiences subjects have had while driving under the influence of alcohol, or while riding as a passenger with someone who was DUI. The questionnaire was constructed so as to suggest the kind of information to include, without unduly influencing the content of that information. It was suggested that the respondents pretend that they were writing a letter to a friend, both to facilitate ease of communication (i.e., by employing a format with which they were familiar), and to get the information in intimate detail.

The questionnaire was administered to 112 undergraduate students enrolled in the Introduction to Psychology course at Virginia Tech. Potential subjects were asked to sign a roster in advance of the group-testing session. Included with the roster was a description of the requirements for participation in the study, i.e., that they had first-hand DUI experience, or intimate second-hand knowledge of an actual DUI event.

Drinking and Driving Advice

If the student attended the previous testing session, but did not have the necessary DUI experience, s/he was given another questionnaire. Extra credit toward their final course grade offered students an incentive for the participation of other subjects. The format of test administration was similar to the previous questionnaire. The only additional instructions issued at the time of administration were to "take your time to write legibly, and please take this task as seriously as possible. Your responses will provide valuable information about the drunk driving problem and may help us to arrive at a workable intervention". All responses were anonymous.

Bottled Beer Consumption at Student Center

In order to get an idea of beer consumption patterns over time, records of bottled beer consumption at Squires Student Center at Virginia Tech were examined for the years 1981 and 1982. Sales records of bottled beer were kept on a daily basis, and every bottle sold was recorded.

Key Person Interviews

Six prominent members of the Blacksburg, Virginia community were interviewed regarding the DUI problem. All participants were persons who, because of their professional status, had an interest in the drunk driving problem. Participants included: 1) The Honorable Roger Hegepath, Mayor of the Town of Blacksburg, Va; 2) Donald Carey, Chief of Police of the Town of Blacksburg, Va; 3) The Honorable J. C. Snidow, President Judge of Montgomery County, Va; 4) Phillip Keith, Esq., Assistant Commonwealth Attorney for Montgomery and Floyd Counties, Va; 5) Raymond Lewis, Chief of Security for Virginia Polytechnic Institute and State University and 6) William Ellenbogen, owner and proprietor of Bogens a popular tavern and restaurant in Blacksburg, VA.

Interviews were conducted with each of the six participants individually during the summer months of 1983. The goal of each interview was to inquire into the interviewees' unique perspective on the drinking problem in the Blacksburg community, especially in regard to students of Virginia Tech. A second purpose was to elicit any suggestions these prominent citizens might have for devising a program to impact the drinking and driving problem in the Blacksburg community. A third objective was to determine the willingness of each interviewee to lend support to a drunk driving intervention. This was accomplished by obtaining the interviewee's reaction to a tentative plan for a "drive-the-drunk-home" project which could be implemented in a small community such as Blacksburg.

Squires Student Center Interviews

A questionnaire was developed and was administered to obtain the opinions of 26 beer-drinking patrons of the University Student Center. The students were first covertly observed as they drank, and were then approached by a research assistant who asked the student to participate in an alcohol survey. The research assistant read each question aloud and recorded the student's response. The questionnaire examined the student's preference for beer in pitchers vs. bottles, what determines how much they are going to drink, why they drink, and what should be done about drunk driving.

Alcohol Fair

In May of 1983 an alcohol fair entitled "Take A.I.M." (Alcohol In Moderation) was organized at Virginia Tech for the purpose of generating public awareness of alcohol and the problems associated with its misuse. Several hundred students attended this outdoor event. A structured interview was administered to participants at this event in an attempt to determine students' willingness to get actively involved as volunteers in a particular

drunk driving intervention. Students were approached by researchers in the alcohol fair area, and were asked three basic questions:

1) "If you had the opportunity to do something significant as part of a volunteer organization to lower the incidence of driving under the influence, how much time per week would you be willing to volunteer?" (Hours per month).

2) "Would you be willing to join a special community group that would learn techniques for promoting alternative forms of transportation among alcohol-impaired drivers?" (A volunteer project to drive alcohol-impaired drivers home was then briefly described. The elements of such a project would require someone to approach the alcohol-impaired individual, someone to drive him/her home, and someone to coordinate the various functions of the organization). " How many hours per month would you be willing to devote to such an endeavor for training and actual field intervention?"

3) "Do you have any ideas or suggestions for reducing drunk driving on a community level?

Drinking Observations

Naturalistic observations were conducted in five bars in the town of Blacksburg, VA, and in the Squires Student Center of Virginia Tech. The town bars were proximal to the university campus and served a primarily student clientele. In the five bars, beer sales for on-premises consumption account for the major source of revenue. In addition, waiters and waitresses provided service at the customer's table in all town bars.

The other site for the study, Squires Student Center, is licensed to sell beer on-premises. However, orders are placed at the counter by the patron who

carries his/her order back to the table. Squires' major revenue source is fast-food items. Beer was available in 40 oz pitchers, 10 oz plastic cups, or 12 oz bottles. Beer prices varied with container type, but in general were about 20% lower than those of the town bars.

Squires was likely to attract students engaged in academic pursuits, since it is located adjacent to the library. Thus, students go to Squires for a quick meal, for an informal meeting, or to study, watch T.V., or play video games.

The large majority of patrons observed in the town bars and Squires reflected the age of the college population, ranging from 18 years (the legal drinking age at the time of the study) to 25 years. For the Student Center observations, a total of 139 subjects were observed (29 females, 110 males). One hundred and four patrons were observed at the five town bars (27 females, 77 males).

The same data observation and collection procedure was used at both the campus and town bar drinking establishments, and occurred over a two-month period in the summer of 1983. Patrons were selected at the time they ordered or purchased beer, and were then observed. While the selection process was not conducted in a strictly random fashion, no subjects were intentionally rejected at the time of selection. That is, when observers were free to pick new subjects, they chose the next available customer(s).

Two research assistants unobtrusively observed each subject and independently recorded data. The observers attempted to remain as inconspicuous as possible by sitting at tables and behaving as normal customers. The information recorded for each subject was group size, subject's gender, container type (pitcher, cup, bottle), arrival and departure time, and type of activity the subject was engaged in while drinking (e.g.,

talking, eating, reading, etc), and time of start and finish of each drink.

An observation period was defined as the time between a subject's arrival (i.e., when s/he sat down with a beer or was served a beer) and his/her departure. The length of the observation periods varied among subjects. The record of group size included both drinking and non-drinking individuals sitting at the observed table. In the event that a container was not entirely emptied, observers estimated the amount of the residual (i.e., 1 inch = 1 ounce).

Fraternity Party Observations

In order to collect accurate field data about student drinking, and to determine whether they are capable of accurately estimating their degree of alcohol impairment, data collection took place at a typical Thursday night fraternity party at Virginia Tech. Students were previously informed that their drinking would be monitored at the party, that they would be asked some drinking-related questions, and that they would be given a breath test as they left the party.

Upon entering the party, students were approached by the researchers and given a numbered badge to wear throughout the evening to enable research assistants to monitor their individual beer consumption. In addition, they were asked to answer a few questions relating to demographic variables (i.e., amount of alcohol consumed prior to the party, etc.) Students then paid the fraternity a two dollar admission fee to gain entry to the party. This fee entitled them to unlimited quantities of beer, snacks, and live musical entertainment.

Three research assistants were stationed behind the bar, one at each tap, and one to record data independently so that a reliability check could be made. These researchers recorded a students' number each time s/he ordered a

beer. Students were helpful in assuring that their numbers were accurately recorded by saying their number and those of friends for whom they ordered drinks. There was only one exit entrance in use at the party, so all students could be observed entering and leaving the party site. No beer was allowed to be brought into the party from outside, and beer was the only alcoholic beverage available.

As students left the party, they were asked a number of questions, including how many beers they drank, how impaired they thought they were, what their blood-alcohol concentration (BAC) was, and whether they were going to drive. Actual BAC levels were measured using the Alco-Sensor BAC testing device (Intoximeters Inc., St. Louis, MO.). All subjects were then asked whether knowledge of their BAC altered their plans to drive from the party.

Results

Drinking and Driving Experience.

Twenty-seven pertinent categories of information were defined from the 112 questionnaires. These 27 categories were further divided according to the range of responses present in the data, thus providing a category for every response in the data pool. Each completed questionnaire was then encoded on op-scan forms using this categorization scheme. Two independent raters then independently encoded all of the data again, using the same categorization scheme. Inter-rater reliability was 78%.

Correlations were calculated between certain subject information and content categories and these are displayed in Table 1. Among the more interesting relationships were a significant negative correlation ($r=-.30$) between numbers of passengers and risk taking ($p<.003$), and a significant positive correlation ($r=.22$) between number of passengers and caution ($p<.04$). However, risk taking was highly correlated ($r=.34$) with drinking passengers

Table 1

Correlations between selected items of the Drinking and Driving Experience Questionnaire (after content analysis).

ITEM NUMBER	#PASSENGERS 1	SEX 2	INJURIES 4	RISKS 5	ACCIDENT 6	CLOSE CALL 8	POLICE 10	#DRINKS 14	CAUTION 18
4 INJURIES									
5 RISKS	r=-.30 p≤.0029	r=-.02	r=-.08						
6 ACCIDENT	r=.09	r=.11		r=.06					
8 CLOSE CALL	r=-.13	r=-.09		r=-.11					
10 POLICE			r=-.13	r=.09	r=.09	r=-.33 p≤.0003			
11 ARREST				r=.09	r=-.06				
14 #DRINKS		r=-.10	r=-.07	r=.01		r=-.03	r=-.18		r=-.12
15 DRINKING DURATION		r=.04	r=-.09	r=.23 p≤.0366	r=-.05	r=-.25	r=-.20		
18 CAUTION	r=.22 p≤.0437	r=.15	r=-.20 p≤.0510	r=-.44 p≤.0001	r=-.32 p≤.0013	r=.31 p≤.0016	r=-.07	r=-.12	
20 PASSENGERS DRINKING			r=-.17	r=.34 p≤.0004					
26 FATAL				r=.20 p≤.0307					
27 OTHER DRUGS		r=.07	r=-.09	r=-.03	r=-.06	r=.18	r=-.07	r=.08	r=-.09

($p<.0004$), and was significantly related to drinking duration ($r=.23$, $p<.04$).

Drinking and Driving Advice

The 101 completed questionnaires were content analyzed by two independent raters. A third rater then reviewed the two sets of encoded data and, where there were discrepancies between two ratings, this rater chose one of the two discrepant ratings as being the more correct. Thus, all assignments of data to categories were approved by at least two of the three raters. The reliability of this process was estimated by dividing the number of discrepancies (i.e., 1470), by the total number of encoding possibilities (i.e., 69,258). This yielded a reliability coefficient of .98.

Several of the responses to the various questions could be dichotomized into "social" responses and "personal" responses. An example of a social response was "I drink because everyone else does", while an example of a personal response was "I drink because I like the feeling it gives me." It was apparent that the great majority of the subjects' responses were of a personal nature. There were no significant differences between male and female questionnaire characters.

Squires Bottled Beer Consumption.

Figure 1 shows the mean bottled beer consumption at Squires Student Center for 1981 and 1982 by day of week, rounded off to the nearest unit. From this graph it is apparent that Fridays account for the greatest number of bottled beer sales, followed by Saturdays and Tuesdays. However, it is unlikely that there are significant differences among days of the week.

Figure 2 shows mean daily bottled beer consumption at Squires Student Center by month for the years 1981 and 1982 combined. The months are arranged in order of the academic year (beginning with September and ending with August). The graph shows that the autumn months account for the greatest

Figure 1

Mean Bottled Beer Consumption at Squires Student CENTER FOR 1981 ANd 1982 by Day of the Week

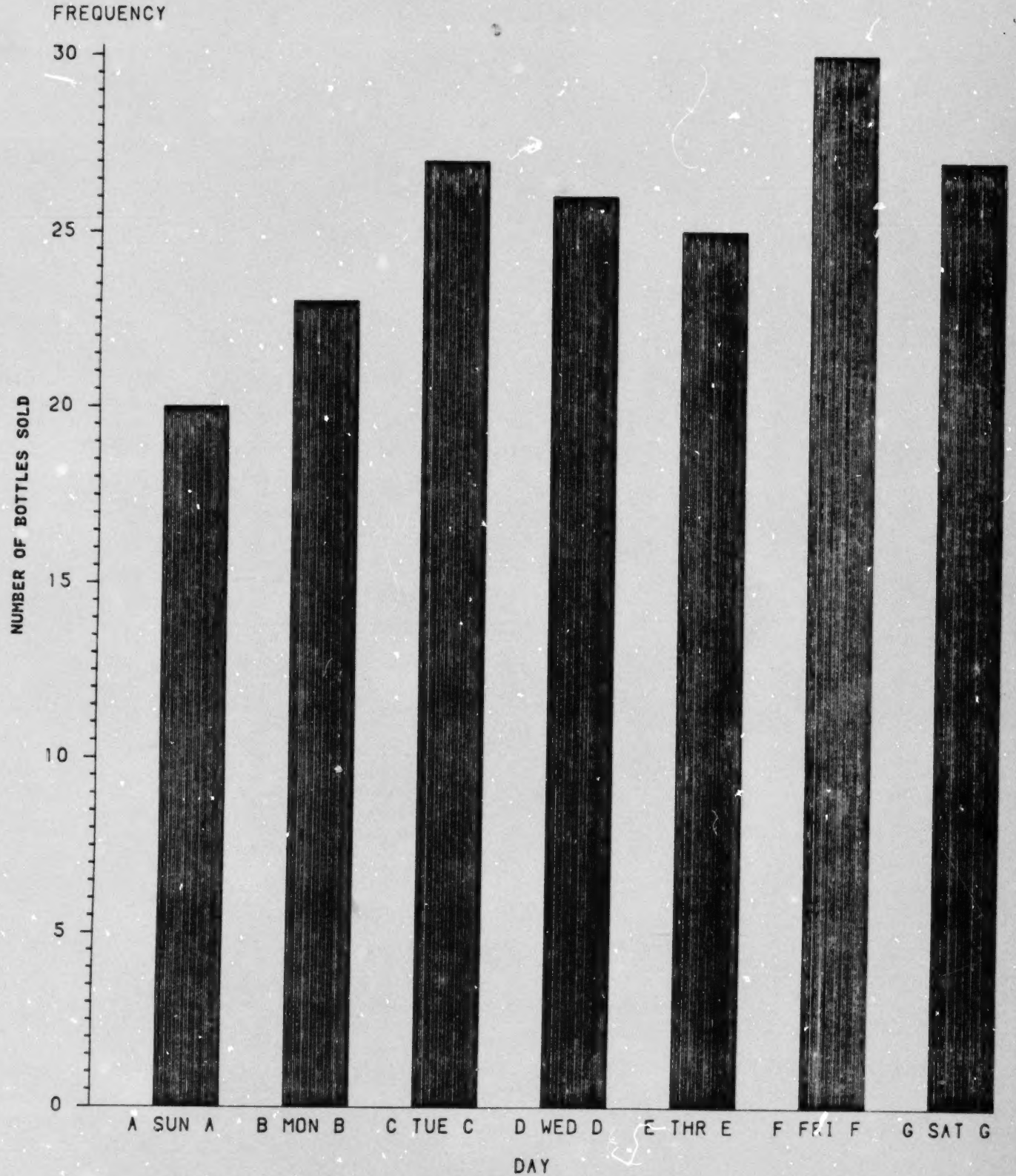
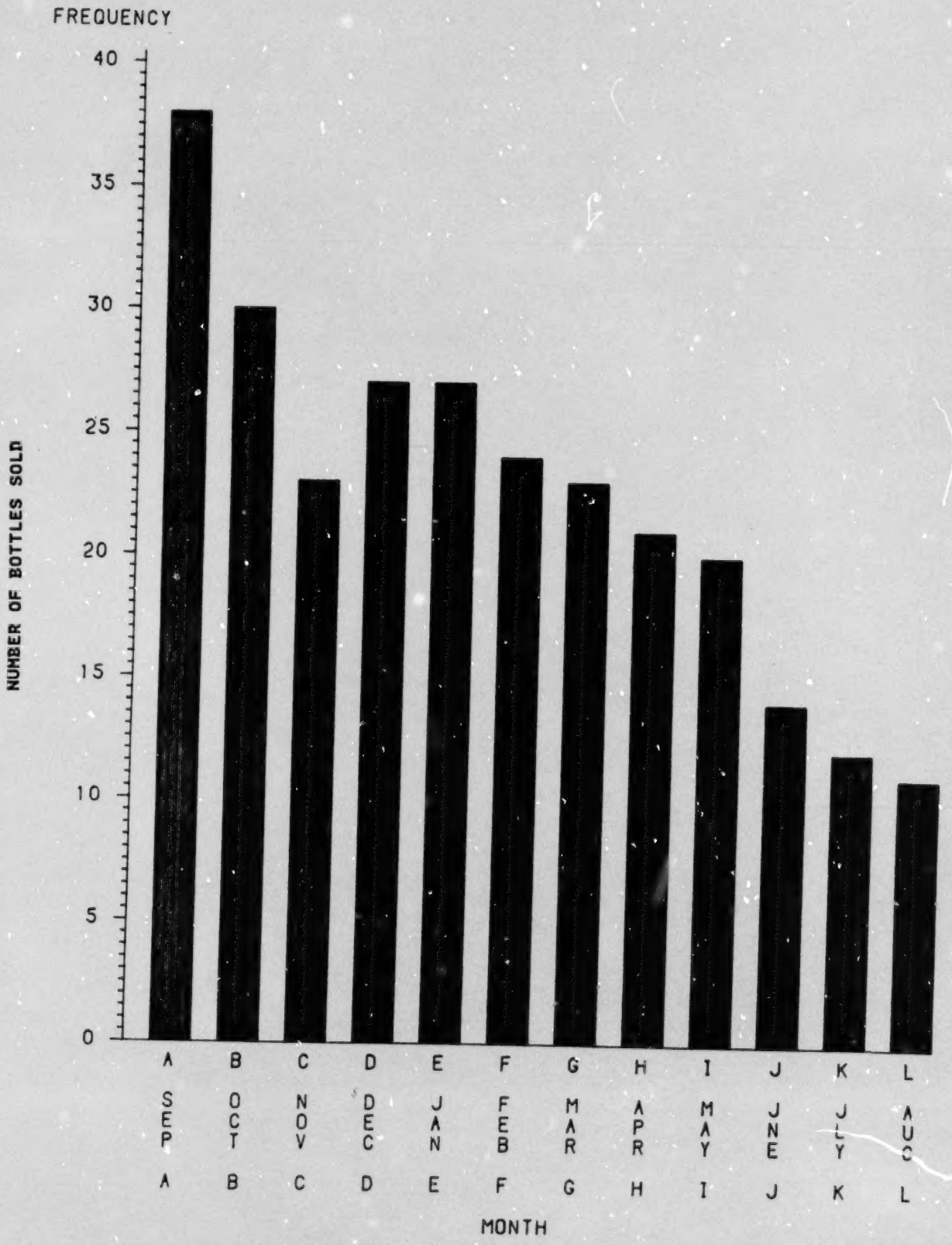


Figure 2
Mean Daily Bottled Beer Consumption at Squires Student Center By Month (1981–1982).



average daily bottled beer consumption, while the summer months account for the lowest average daily bottled beer consumption. These figures were determined by dividing monthly bottled beer sales by number of days that Squires was open for business during any given month.

Key Person Interviews

All of the persons interviewed were supportive of some type of DUI intervention. The idea presented to them was generally a "third party intervention scheme", namely, a drive-the-drunk-home project to be operated under the auspices of the university and to be staffed by students. A few of the more interesting and informative comments from these interviews were as follows:

1. "Tech students comprise roughly 75% of the DUI arrests in Blacksburg." Phillip Keith, Assistant Commonwealth Attorney for Montgomery County, Virginia.

2. "I feel the University is responsible for its students' behavior whether they are on campus or off campus." Raymond Lewis, Chief of Security, Virginia Polytechnic Institute and State University.

3. "DUI enforcement is a priority with this department." Donald Carey, Chief of Police, Blacksburg, VA.

4. "Raising the drinking age does nothing more than take the drinking out of the bars, where it's supervised, and puts it somewhere else. Some of it, no doubt, will take place in cars." William Elienbogen, owner of Bogen's, a Blacksburg, VA bar.

5. "I think even the bar owners, at least the few that I know, would generally be receptive to ideas whereby they wouldn't produce very inebriated people, because they don't want the stigma, either, of somebody going out and having a very serious accident." Roger Hegepath, Mayor, Blacksburg, VA.

6. "In doing a study five years ago and one three years ago, the blood alcohol concentration of (arrested) Tech students went up an average of two hundredths of a point....I think there's a definite need for it (an intervention)." David Craig, Executive Director, New River Valley Alcohol Safety Action Program.

7. "Corrective instead of punitive interventions has been my theory, and I still think that correction is better than punishment, and I think the same thing applies as far as students are concerned." The Honorable J.C. Snidow, President Judge of Montgomery & Floyd Counties, VA.

Squires Student Interviews at Student Center

Of the 26 patrons of Squires Student Center who were interviewed, 18 were males (69%) and 8 were females (31%). Sixty-nine percent of the sample drank from pitchers, 27% from bottles, and 4% from cups. Most said they drank from pitchers because it was convenient and was cheaper. Fifty-eight percent would like to see alternative sizes of pitchers served, while 31% said they would not like to see additional pitcher sizes. The two most popular advantages mentioned for drinking from pitchers were: a) convenience (the opportunity to buy a quantity of beer which approximates the amount desired without making several trips to the bar), and b) less waste (two individuals mentioned the fact that one pitcher is too much for one person and s/he could get drunk.)

The reasons advanced for drinking included: a) to relax, b) because it's Friday night, c) they like the taste, d) because they are taking a break from studying, e) to help swallow food, f) to socialize, g) it gives them a lift, h) to kill time, i) to get drunk, j) it makes it easier to do busy work; and k) to avoid studying.

According to these subjects the factors which determine amount of alcohol consumed are: a) plans for the evening, b) whether they are having a good

time, c) thirst, d) season, e) how much work they have to do, f) mood, g) whether their stomach is full or empty, h) whether they are driving, i) how much money they have, j) number of people around (the more people, the more drinking), k) weather, m) how drunk they have to get to relate to the people they are with, and n) what the occasion is.

Thirty-one percent of the sample reported consuming some alcohol prior to coming to the Student Center, and 11% said they would go somewhere else to drink after leaving the center. Regarding transportation to the Student Center, 27% drove, 11% rode as passengers, and 62% said that they walked.

At the time of the interview, fifteen percent considered themselves to be alcohol impaired. While 23% said they would drive after leaving the center, none of those who considered themselves to be alcohol impaired said they were going to drive. Overall, only 17% admitted to ever driving a car after drinking too much at the Student Center. For those who said they were going somewhere else to drink, the reasons they gave were: a) for recreation, b) to hear a band, c) it's better than staying home, and d) to visit friends.

Several of the students (i.e., 61%) said the Student Center should do something to discourage DUI. Their suggestions were as follows:

1. Place a small warning sign where beer is picked up (24%)
2. There is nothing they can do (20%)
3. Don't serve impaired patrons (16%)
4. Provide cab service (8%)
5. Have people drive drunks home (8%)
6. Call security (8%)
7. Stop selling beer (4%)
8. Don't let drunks leave (4%)
9. Keep track of amount served to individuals (4%)

When the subjects were asked to provide suggestions about how to reduce drunk driving, they felt that these interventions would be helpful:

1. Taxi service
2. Road Blocks
3. Jail for DUI
4. Increased fines
5. Stricter laws
6. Do not raise the drinking age
7. Bars should not serve drinks
8. A behavioral task in cars
9. Raise the drinking age
10. Get friends to help more
11. No stricter penalties
12. Education about alcohol
13. Raise the legal DUI limit
14. Make punishment correspond to the degree of intoxication
15. Do not let drunks leave establishments
16. Treat DUI as a crime
17. Do not sell beer in gas stations (as is now done in Virginia)
18. Revoke licenses for two years upon conviction for DUI
19. Put breathalyzers in bars
20. Put breathalyzers in cars
21. Have police make random, routine stops at bars and parties

Alcohol Fair

The sample consisted of 13 males and 10 females, all of whom were students at Virginia Polytechnic Institute and State University. Of this sample, 66% said they were willing to volunteer some time for a DUI

intervention project in Blacksburg; 30% said they were unwilling to volunteer; and 4% said maybe they would volunteer. The mean number of hours which volunteers would be willing to spend on such a project was 15 hours per month. There were no significant differences between males and females on willingness to volunteer or number of hours volunteered. However, females indicated they would like to spend an average of 11 hours per month on training and discussion meetings, and 5 hours per month on intervention in the field; whereas males indicated they would be willing to spend an average of 5 hours per month on training and discussion, and about 10 hours per month on intervention in the field.

Drinking Observations

A total of 256 bar patrons was observed in bars in the vicinity of Virginia Tech between May and July of 1983. Each observation provided the following information: Gender, beer container type (pitcher, bottle, cup), number of persons drinking at each table (i.e., group size), number of drinks, total amount consumed in ounces, time required to consume each drink, and total time the subject spent in the bar. In addition, drinking rate per ounce was calculated by dividing the total number of ounces of beer consumed by the total number of ounces of beer consumed by the total time required to consume each drink.

Of the 256 observations, 147 (57%) were solo observations and 109 (43%) were observed by two independent observers. Ninety eight percent agreement was achieved for observing total ounces consumed (± 1 oz). The percent agreement for total time in bar (± 5 min) was .99. Thirteen observations were ultimately deleted from the analysis for data discrepancies; thus, a final data pool of 243 observations was used in the analysis.

Table 2 gives a summary of the descriptive statistics for bar

Table 2

Descriptive Statistics for Drinking Observations

1. GENDER:

Males = 187 (77%) Females = 56 (23%)

2. CONTAINER CHOICE:

	GLASS	BOTTLE	PITCHER
MALE	24	42	120
FEMALE	2	11	43
% of Sample	11%	21%	68%

3. GROUP SIZE:

	1	2	3	≥4
MALE	40	90	29	28
FEMALE	5	26	11	14
% of sample	18%	48%	16%	17%

4. MEAN TOTAL OUNCES CONSUMED: 28.84oz (S.D.=19.80)

MALE X=30.0 RANGE=5-123 S.D.=20.73

FEMALE X=25.0 RANGE=8-68 S.D.=15.85

5. MEAN TOTAL MINUTES IN BAR: 53.6 Min (S.D.=34.77)

MALE X=50.3 RANGE=5-175 S.D.=33.89

FEMALE X=64.7 RANGE=11-166 S.D.=35.65

6. MEAN DRINKING RATE IN OUNCES PER 10 MINUTES: 7.12oz (S.D.=5.19)

MALE X=7.6 RANGE=1.62-33.33 S.D.=5.87

FEMALE X=5.6 RANGE=1.37-14.29 S.D.=2.92

observations. This table reveals that 77% of the sample was male, and 68% of the sample drank from pitchers. The modal group size was 2. The mean total ounces of beer consumed for the sample was 28.8 oz, ranging from 5 oz to 123 oz, with a standard deviation of 19.8 oz. The mean total minutes in the bar for the sample was 53.6, the range was 5 min to 175 min, and the standard deviation was 34.8 min. The mean drinking rate in ounces per ten minutes for the sample was 7.12, with a range of 1.37 oz to 33.33 oz per ten minutes and the standard deviation was 5.19 oz.

Figure 3 shows the mean total ounces consumed, by Container Type for males and females. The analysis of variance revealed a significant main effect of Gender, $F(1,241)=3.74$, $p<.05$, and Container Type, $F(2,241)=54.37$, $p<.0001$. Figure 3 shows that these differences occurred mainly in the "pitcher" condition. This category accounts for 68% of the sample; thus, any differences in this condition were weighted heavily.

Figure 4 depicts the mean drinking rate (in ounces per 10 minutes) as a function of Container Type for males and females. Analysis of variance indicated a significant effect of Gender, $F(1,241)=22.66$, $p<.0001$, which is apparent across all Container Types, with males drinking at a consistently more rapid rate than females (i.e., at approximately one ounce of beer per minute).

Figure 5 shows the mean total minutes spent in the bar as a function of Container Type for males and females. There were significant main effects for Gender, $F(1,241)=9.86$, $p<.0019$ and Container Type $F(2,241)=31.54$, $p<.0001$, with females in the bottle and pitcher conditions spending prominately more time in the bar than males. In the glass condition, males and females were roughly similar in amount of time spent in bar.

The impact of Group Size and Gender are depicted graphically for each

Figure 3
Mean total ounces consumed by container type for males and females.

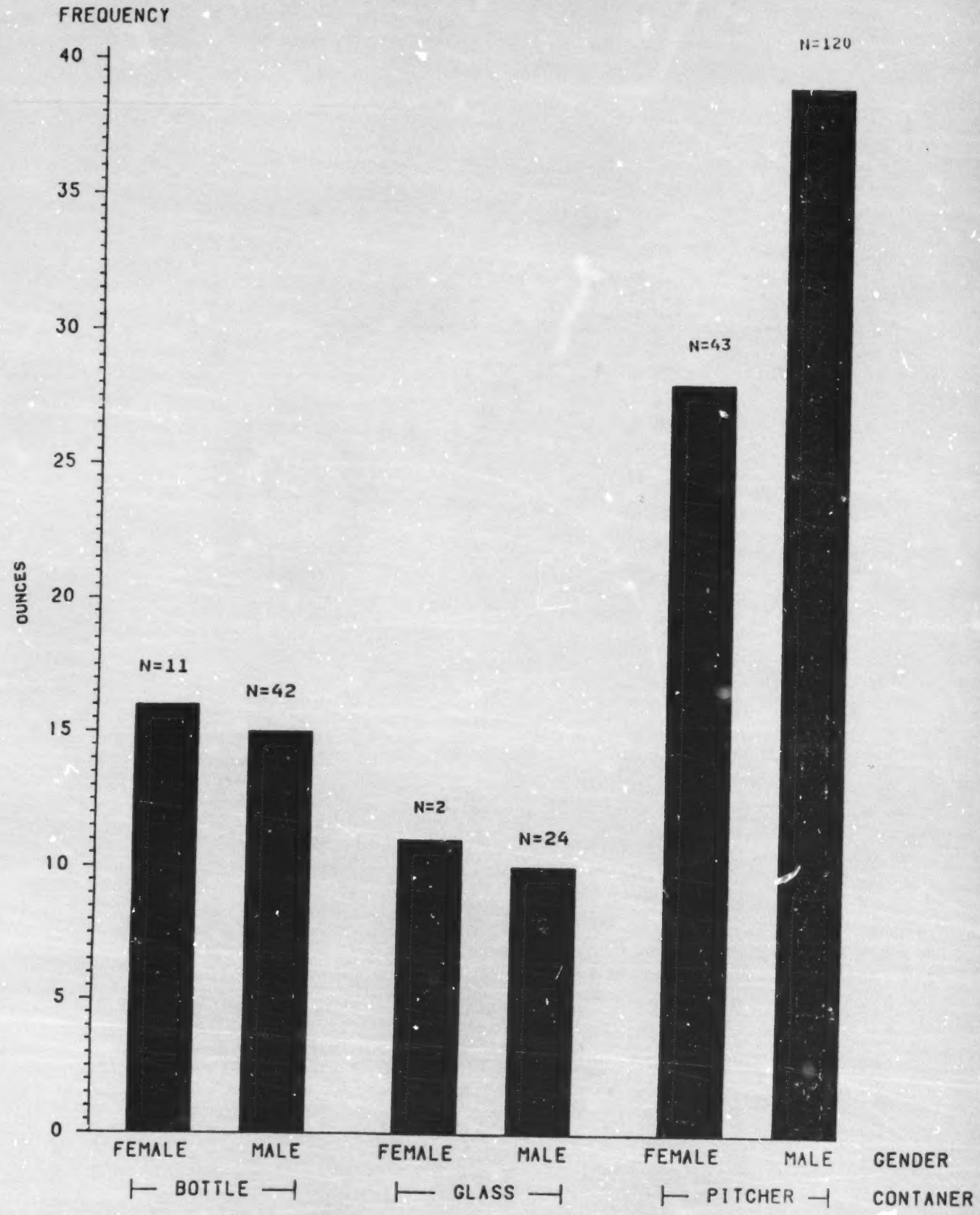


Figure 4

Mean drinking rate (in ounces per 10 minutes) by container type for males and females.

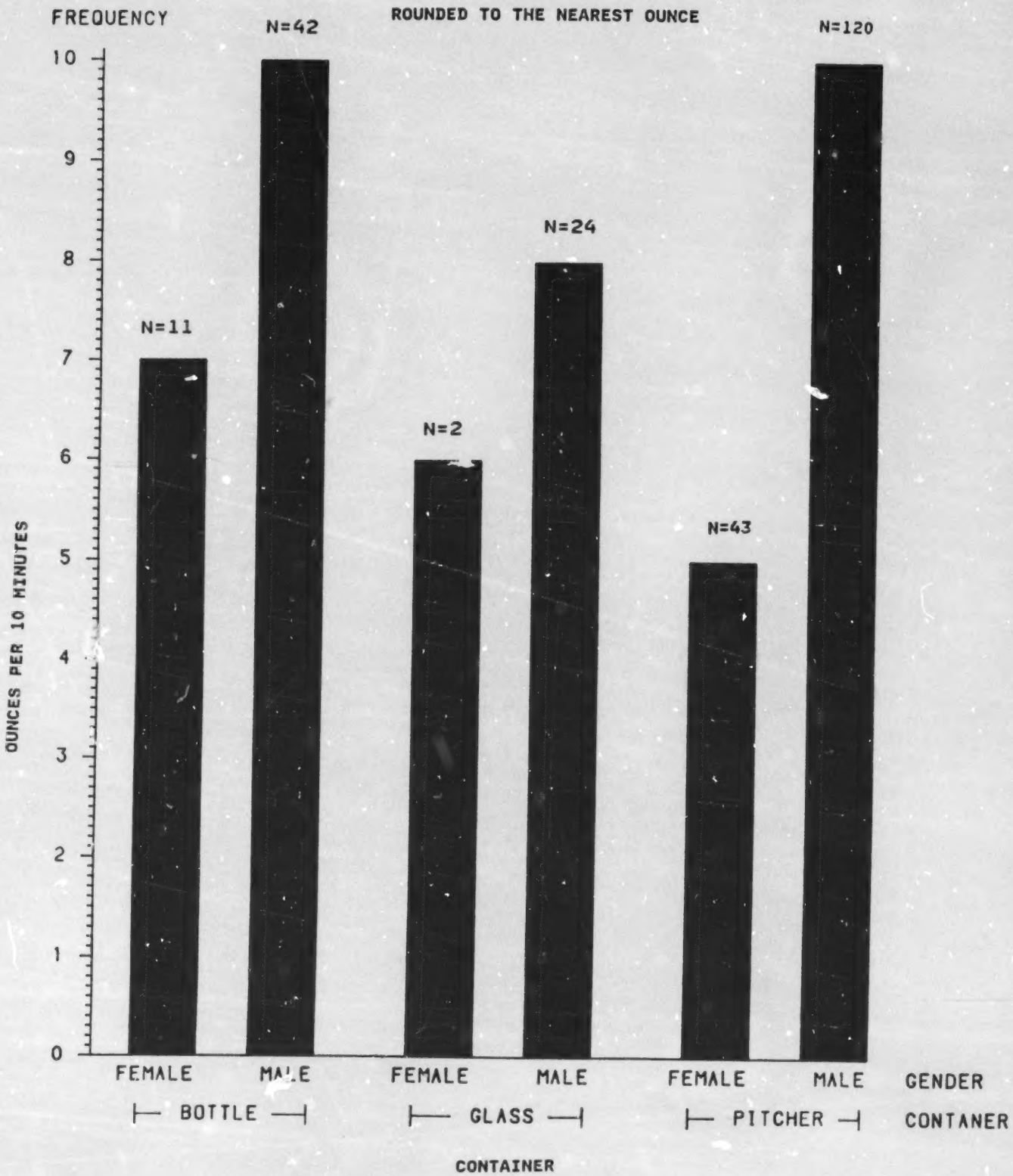
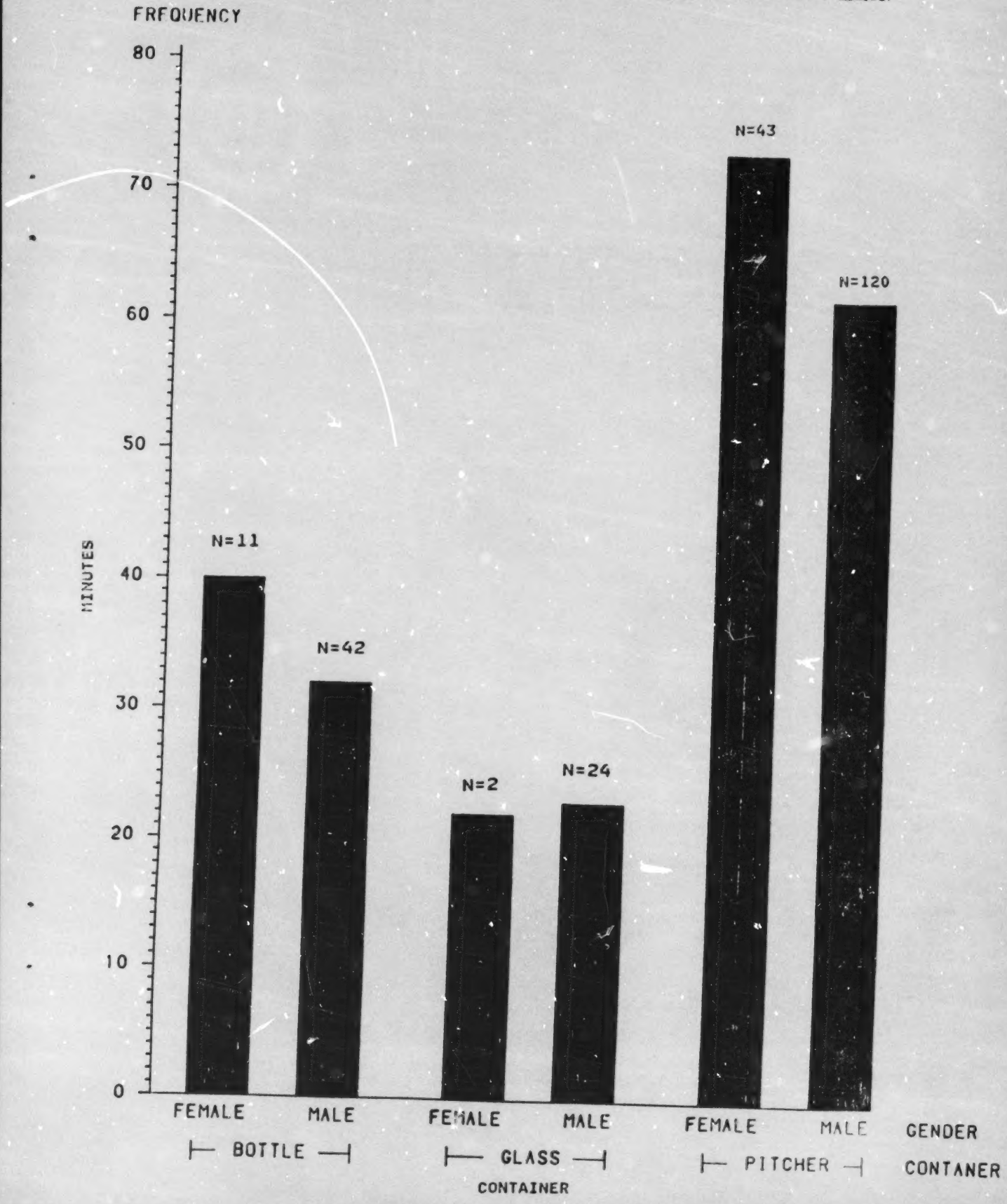


Figure 5

Mean total minutes in bar by container type for males and females.



dependent variable in Figures 6, 7, and 8. Figure 6 illustrates mean total ounces consumed by Group Size for males and females. The analysis of variance demonstrated a significant main effect of Group Size, $F(3,242)=6.18$, $p<.0005$, and a trend toward significance for the Gender main effect, $F(1,242)=2.94$, $p<.09$. The graph shows increasing differences between males and females in total ounces consumed as Group Size increased, with males consistently drinking more than females.

Figure 7 demonstrates the significant main effect of gender, $F(1,242)=22.71$, $p<.0001$, for drinking rate (in ounces per 10 minutes). For each group size males drank at prominently faster rates than females.

Figure 8 depicts average total minutes in the bar as a function of Gender and Group Size. The analysis of variance showed significant main effects of Gender, $F(1,242)=7.80$, $p<.01$. Females spent more time in the bar than males, especially when the Group Size was greater than or equal to 4.

Fraternity Party Drinking and BAC Feedback.

Of the 114 students who participated in the initial interview at the fraternity party, several were eliminated from the final analysis. Twenty-one were dropped because they did not participate in the exit interview as they left the party, or because pre- and post-interview ID numbers could not be matched. Most of the analyses were conducted with data from the remaining 93 subjects. Prior to calculating the beer consumption data, another 28 subjects were dropped due to discrepancies in their beer consumption record, or because they were observed engaging in drinking games which made accurate recording of their beer consumption impossible. Hence, the analyses involving beer consumption were conducted on only 65 subjects.

Table 3 reveals that party-goers were 45% male and 55% female, ranging in age from 18 to 25 years, with all four academic levels represented. Sixty

Figure 6

Mean total ounces consumed by group size for males and females.

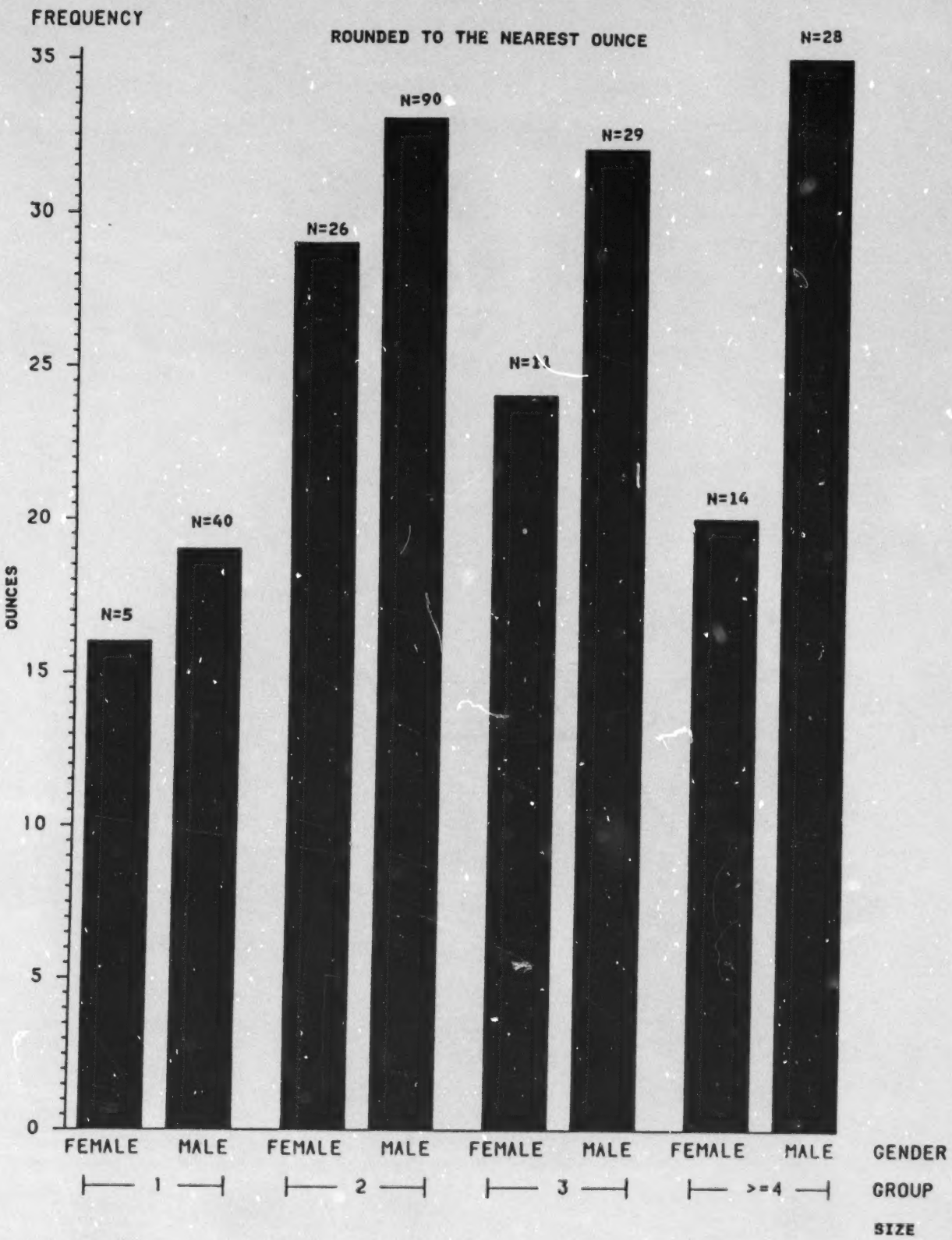


Figure 7

Mean drinking rate (in ounces per 10 minutes) by group size for males and females.

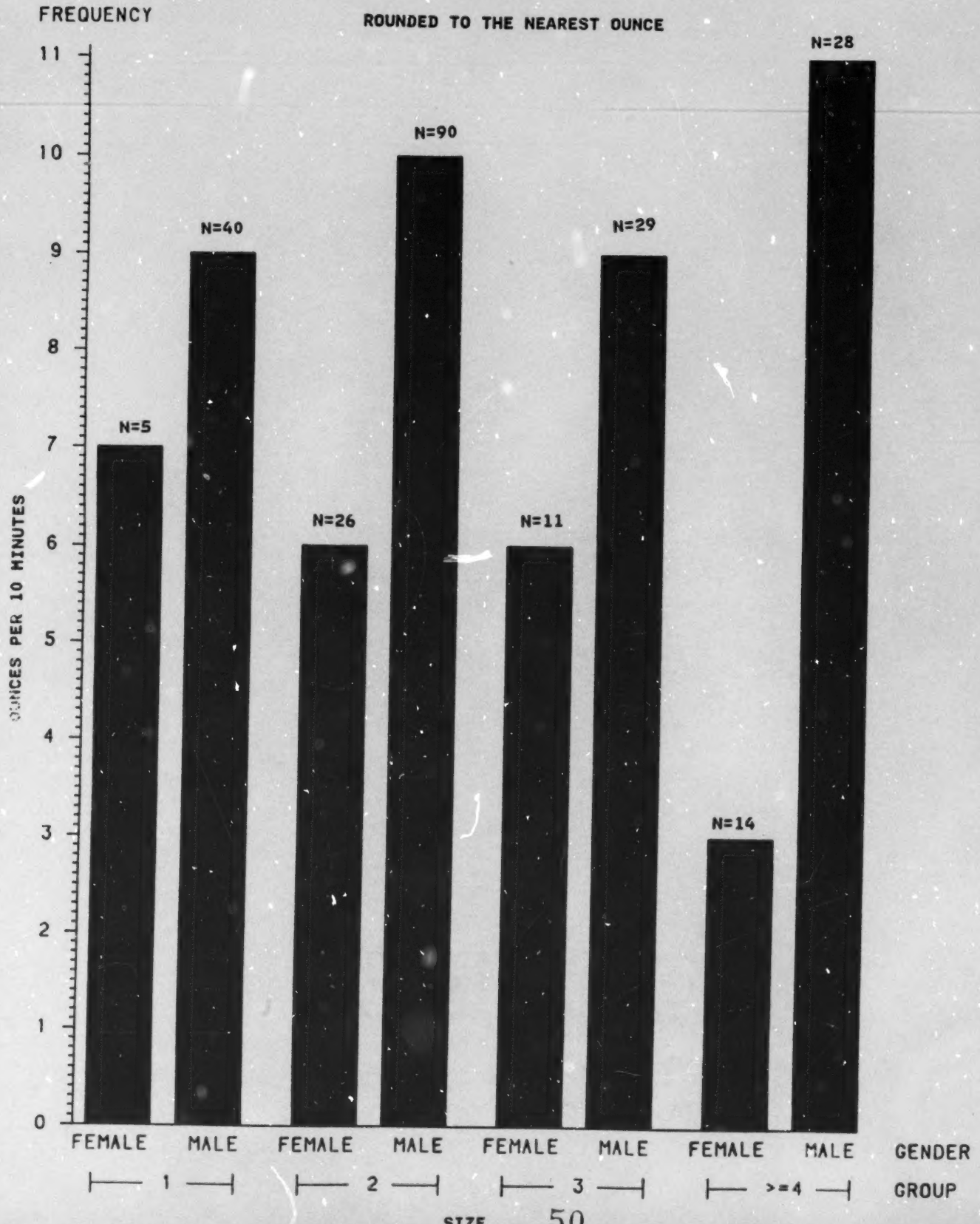


Figure 8

Mean total minutes in bar by group size for males and females.

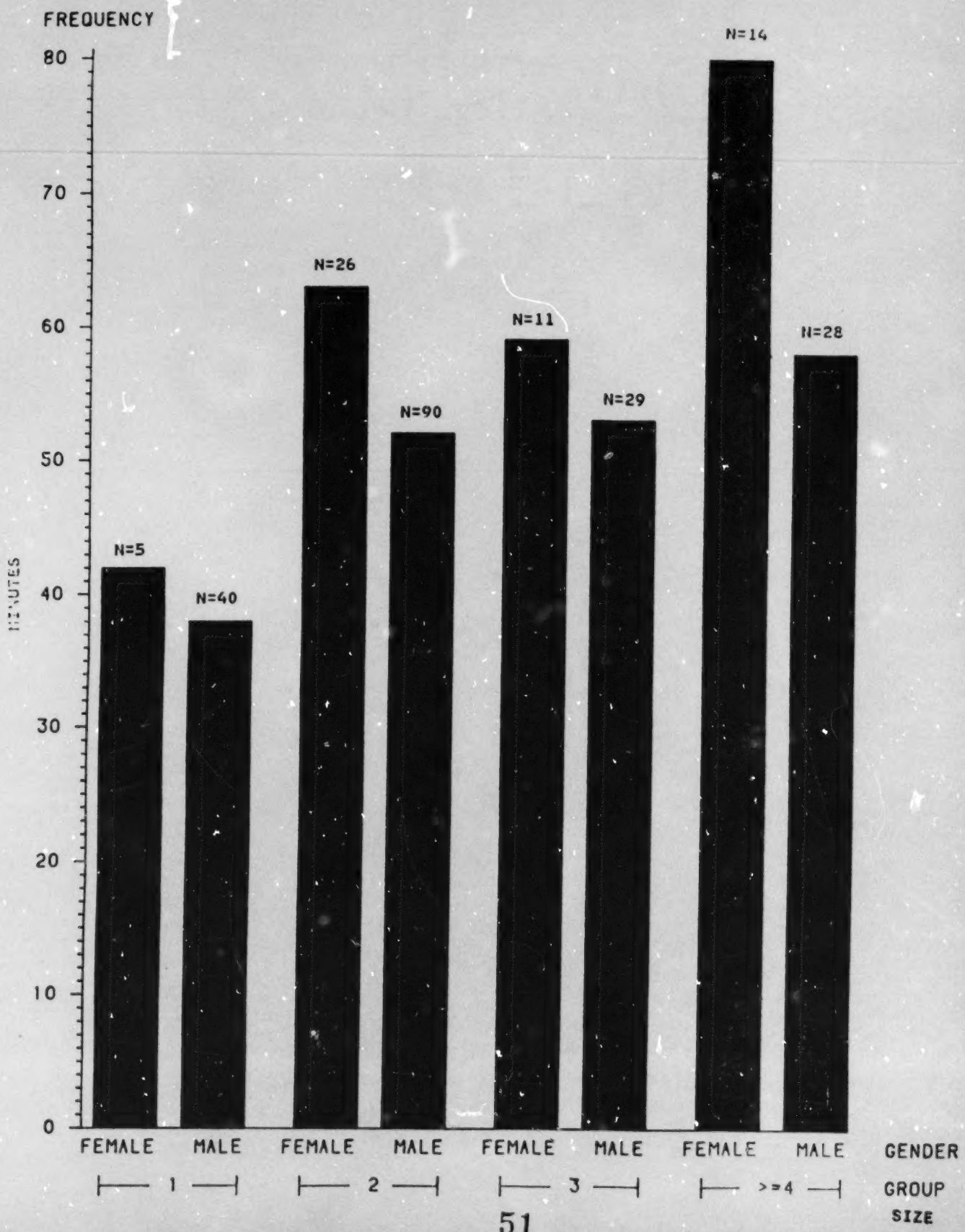


Table 3
Summary of Before and After Interview Data (N=93)

1. Sex: Males=42 (45%) Females=51 (55%)
2. Age Range: 18-25 years, 60% under age 21
3. College year: Freshman 20(21.5%), Sophomore 20(21.5%), Junior 23(24.7%, Senior 4(4.3%), other 1(1.0%)

	YES	NO
4. Did you drink before coming to the party?	39 (42%)	54 (58%)
5. Did you drive to the party?	35 (38%)	58 (62%)
6. Do you plan to drive after the party?	34 (36%)	59 (64%)
7. Do you think you are legally drunk?	47 (50.5%)	46 (49.5%)
8. Of those who drove, "Do you think you are too drunk to drive?"	4 (11.4%)	31 (88.6%)
9. Of those who were passengers, "Do you know how much your driver had to drink?"	25 (52%)	23 (48%)
10. Were you affected by the experimenters' presence?	11 (12%)	82 (88%)
11. Of those affected, "Did experimenters' presence cause you to drink more than usual?"	7 (64%)	4 (36%)
12. Given BAC feedback do you (would you) still plan to drive?	49 (52.8%)	44 (47.2%)
13. Would you ride with someone with the same BAC as you?	66 (71%)	27 (29%)
14. If not driving how do you plan to get home?	walk--64 (68.7%)	Ride with someone--29 (30.3%)

15. Estimated BAC
Range: .00%-.36% (16.1% unreasonable estimates)*

EST <.10%: 57 (61.3%)
EST ≥.10%: 36 (38.7%)

Actual BAC
.00%-.23%

BAC <.10%: 64 (68.8%)
BAC ≥.10%: 29 (31.2%)

OVERESTIMATED BAC (EST. BAC>ACTUAL BAC)- 24 (26%)
EXACTLY ESTIMATED BAC (EST. BAC=ACTUAL BAC)- 15 (15.6%)
UNDERESTIMATED BAC (EST. BAC<ACTUAL BAC)- 54 (58.4%)

* unreasonable BAC estimate was any estimate beyond .50% since BAC levels in this range would be lethal.

percent of the subjects were under age 21. Forty-two percent had drunk some alcoholic beverage prior to arriving at the party. Of the 38% who had driven to the party, almost all of them planned to drive after the party.

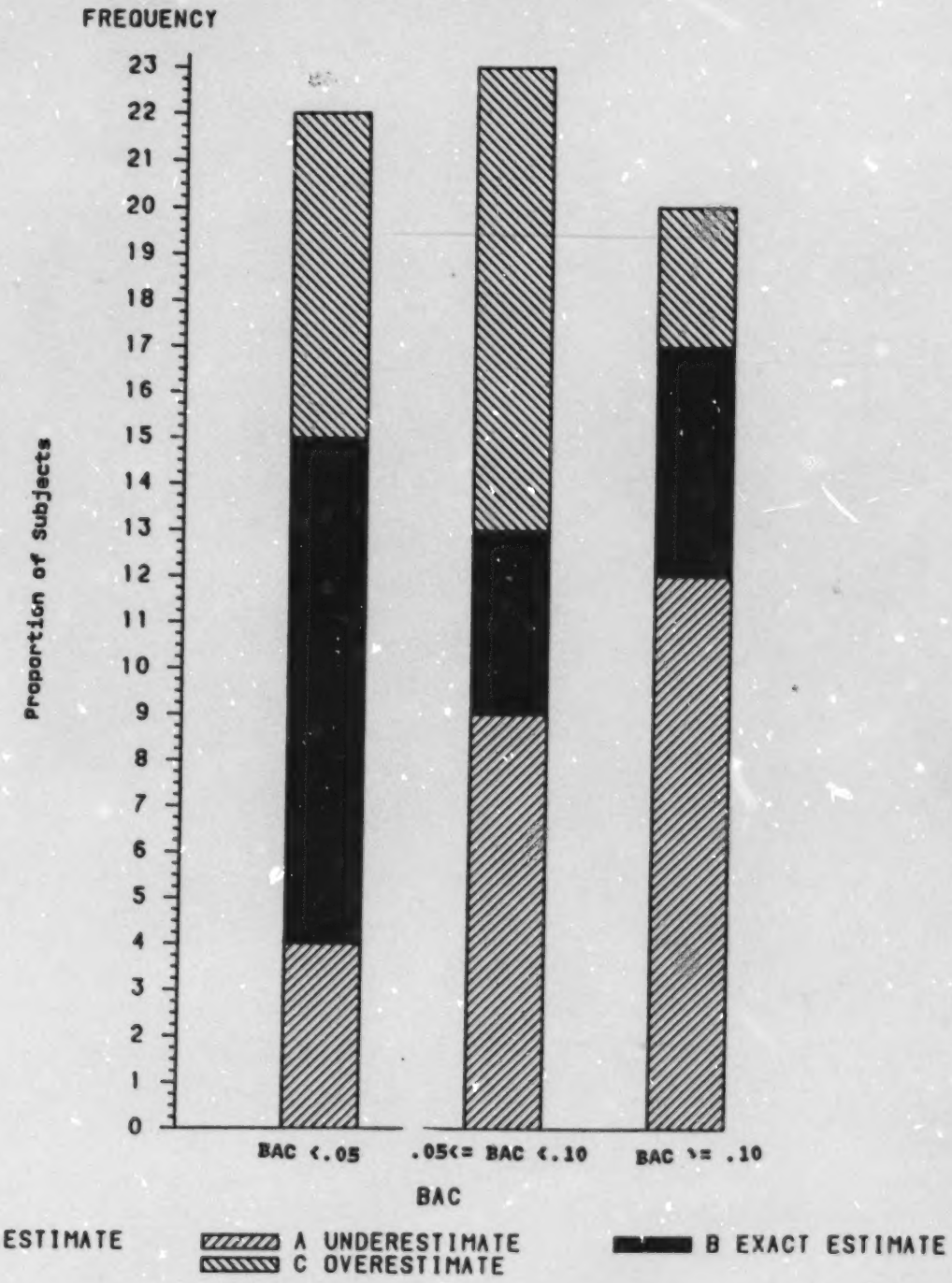
At the post-party interview 47 subjects reported that they felt legally drunk. However, measurement of BAC levels indicated that only 29 individuals were legally drunk. Of those who drove, 11.4% thought they were too drunk to arive. Of those who were passengers, 52% said they knew how much their driver had to drink. Eleven individuals (12%) said they were affected by the experimenters' presence, and seven of those individuals said this presence actually caused them to drink more than usual. About half of the subjects (53%) said that they would drive after receiving feedback of their BAC, and 71% said they would ride with someone who had the same BAC as they did.

When BACs were dichotomized into legally drunk ($\geq$10%) or not legally drunk (<10%), BAC estimation was reasonably accurate for the sample taken as a whole. Sixty-four individuals were measured as having a BAC of less than .10%, and 57 of these individuals estimated their BAC's under .10%. Twenty-nine individuals were measured as having a BAC greater than or equal to .10%, whereas 36 individuals estimated their BAC's at .10% or greater. Thus, as a group, this sample tended to be slightly conservative in their estimations of BAC, saying that their BAC's were higher than actually measured. A more precise picture of BAC estimation is given by looking at individual BAC estimates. The majority of individuals (58.4%) tended to underestimate their BAC levels (Item 15).

Figure 9 shows the number of subjects underestimating, correctly estimating ($\pm$1 cup), and overestimating number of cups of beer drunk, as a function of BAC level, χ^2 (1,65)=11.1, $p<.02$. There was a monotonic relationship between BAC and the tendency to underestimate the number of cups

Figure 9

Proportion of Subjects Underestimating, Correctly Estimating, and Overestimating Number of Cups, by BAC Level.



of beer consumed, with individuals in the high BAC condition (BAC≥.10%) showing the greatest tendency to underestimate the number of cups drunk. Also, those whose BAC was less than .05% showed the greatest ability to estimate accurately the number of cups of beer drunk. This could possibly reflect the fact that persons in this condition tended to have fewer drinks, and hence had to remember a fewer number of cups.

Figure 10 shows the number of subjects underestimating, correctly estimating, and overestimating BAC level as a function of actual BAC, $X^2(4,65)=25.7$, $p<.001$. It is notable that when estimating BAC level, those in the high BAC condition (BAC≥.10%) showed an overwhelming tendency to overestimate their BAC level, while most subjects in the other BAC conditions underestimated their BAC level.

Figure 11 shows mean time in minutes between arrival and first drink for males and females as a function of BAC at the end of the party. It is apparent that both males and females in the high BAC condition (BAC ≥.10%) had a short latency between arrival and first drink when compared with the other two BAC conditions, except that females had equal latencies in the intermediate BAC condition (.05% ≤BAC<.10%). The difference between males and females in this condition is striking. Analysis of variance indicated a significant main effect of only BAC, $F(2,59) = 4.2$, $p<.02$.

Figure 12 shows mean time in minutes between first and last drinks for males and females as a function of BAC. For males and females, BAC levels and time spent at the party covaried. Males spent more time between first and last drinks than did females. Analysis of variance showed significant main effects of both BAC and Gender, $F(2,59)=14.0$ and $F(1,59)=25.2$, respectively ($ps < .0001$).

Figure 13 shows mean time in minutes between last drink and departure

Figure 10

Proportion of Subjects Underestimating, Correctly Estimating, and overestimating BAC, by actual bac level.

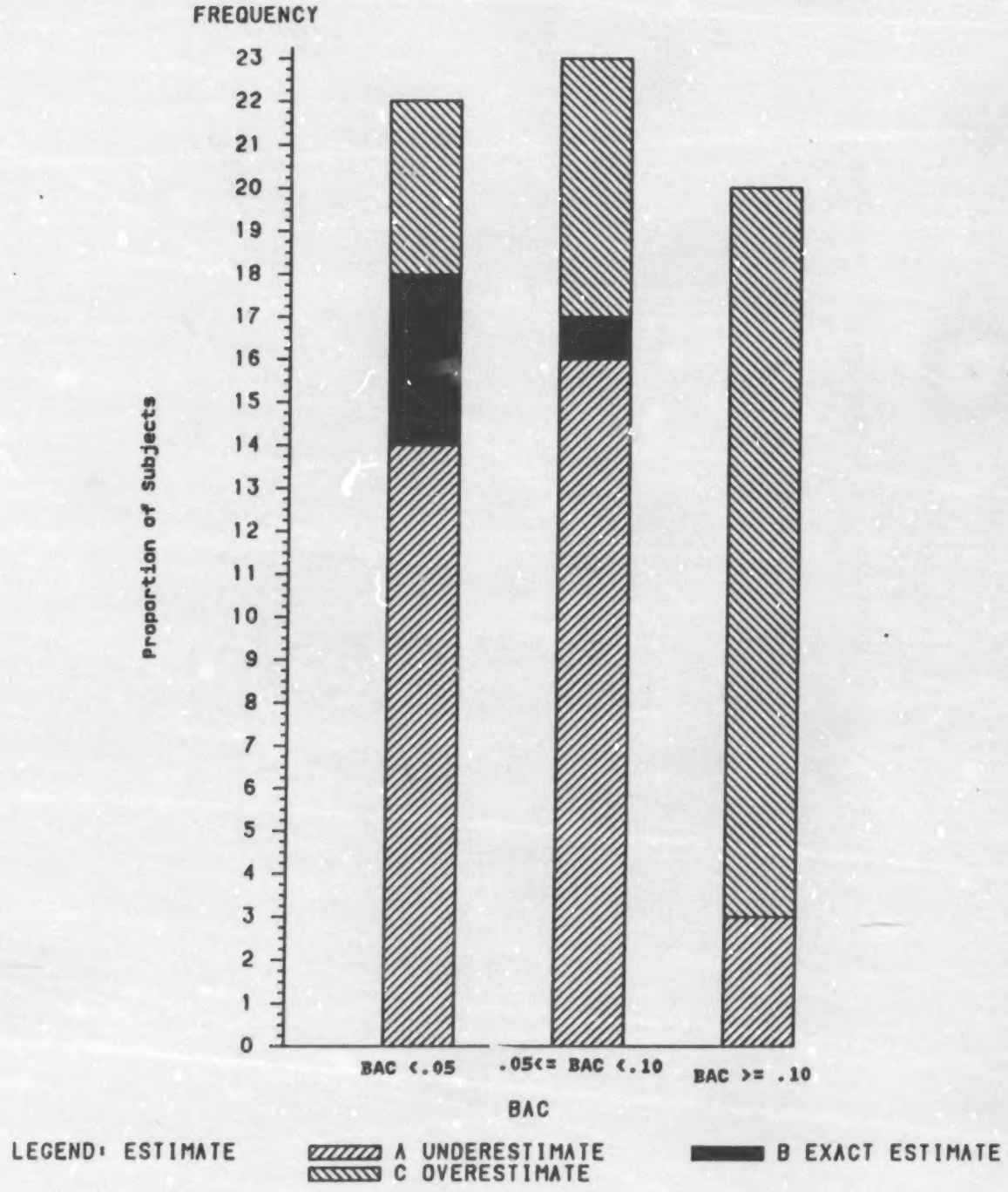


Figure 11

Mean time in minutes between arrival and first drink for males and females by BAC

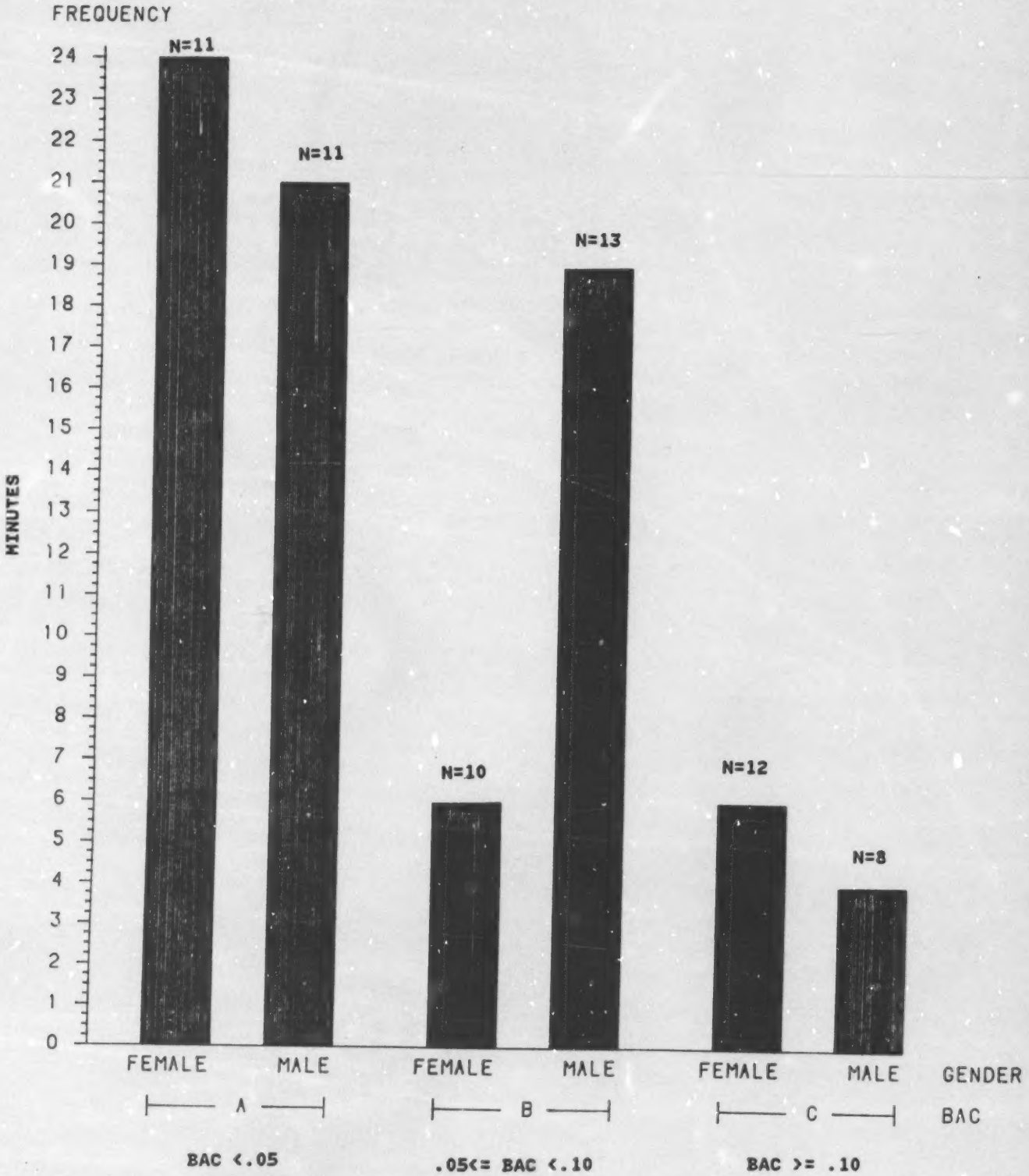


Figure 12

Mean time in minutes between first and last drinks for males and females, by BAC.

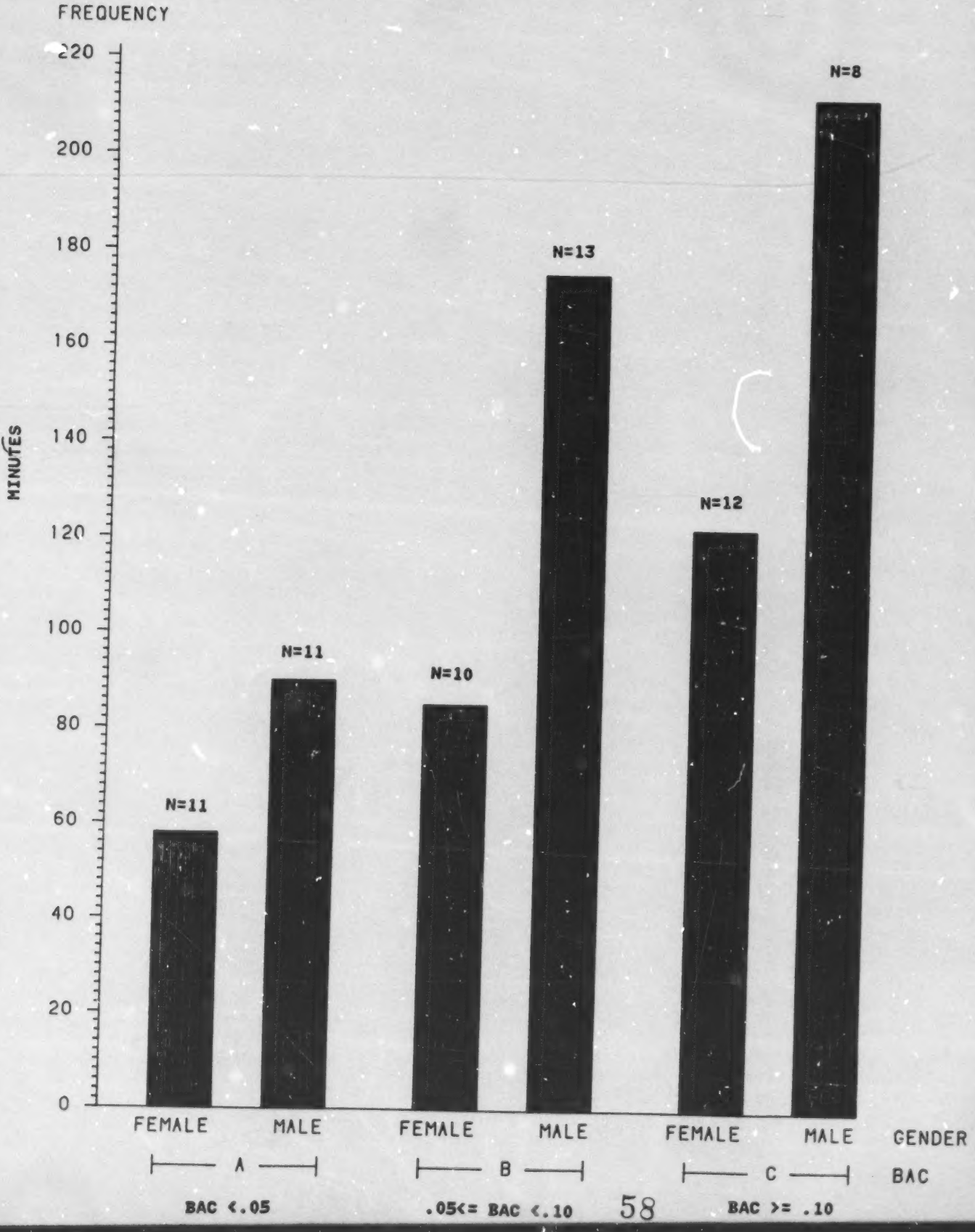
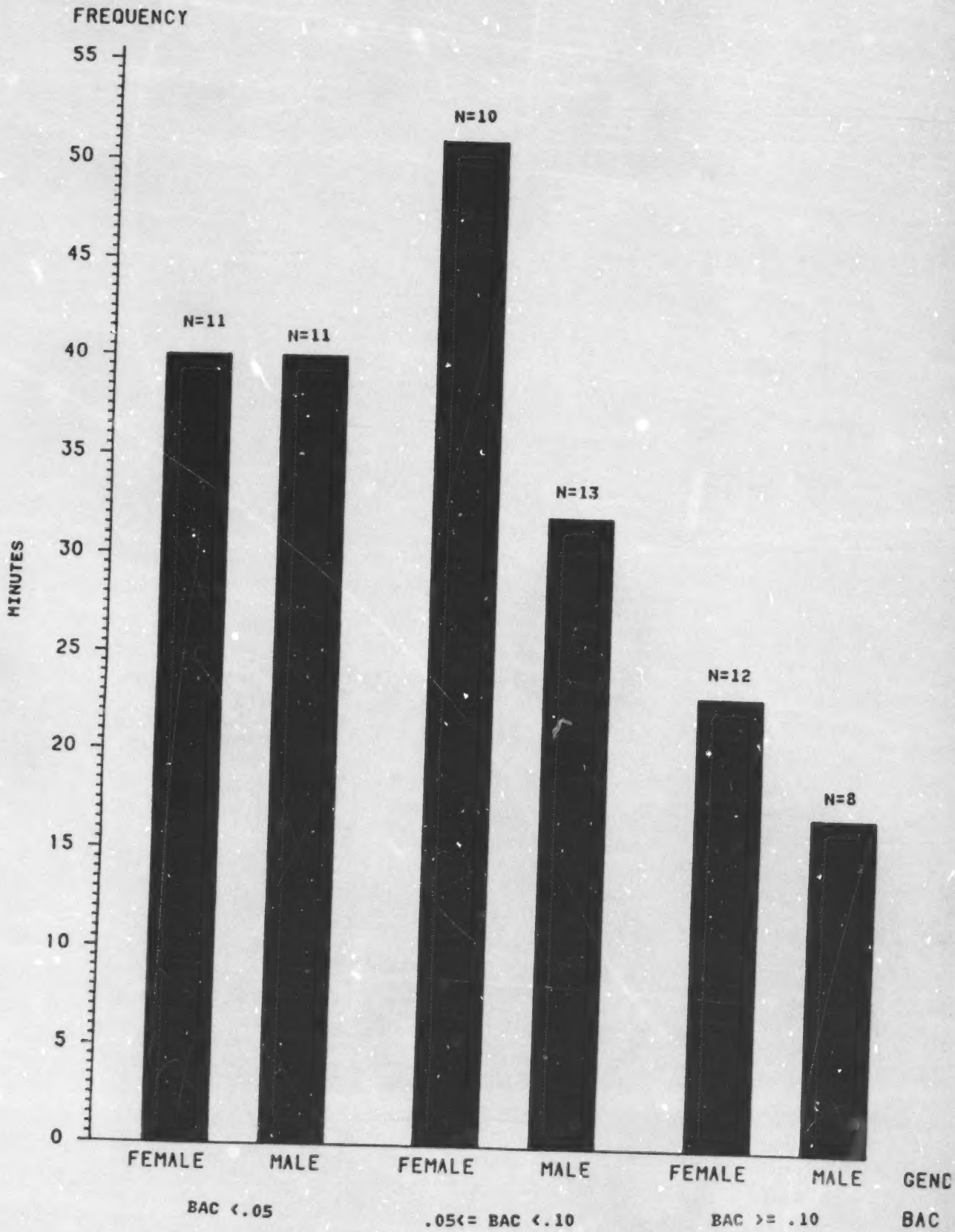


Figure 13

Mean time in minutes between last drink and departure from party for males and females, by BAC



from party as a function of BAC for males and females. This interval can be characterized as "sobering-up" time. At all BAC levels, females spent as much or more time "sobering up" as males. For males, sobering up time decreased with increasing BAC; and for females, the high BAC condition also accounted for the least "sobering up" time. An analysis of variance indicated a significant main effect of BAC, $F(2,59)=3.2$, $p < .05$.

Figure 14 shows the mean total time in minutes spent at the party for males and females, partitioned by BAC. Males tended to spend more time at the party than did females, and the mean times of females across BAC conditions were within 30 minutes of each other. For males, the middle and high BAC conditions were similar (226 min. vs. 232 min.), respectively, but much less time was spent at the party by those in the low BAC classification. The analysis of variance showed significant main effects of both BAC and Gender, $F(2,59)=4.2$, $p < .02$ and $F(1,59)=15.3$, $P < .0002$, respectively.

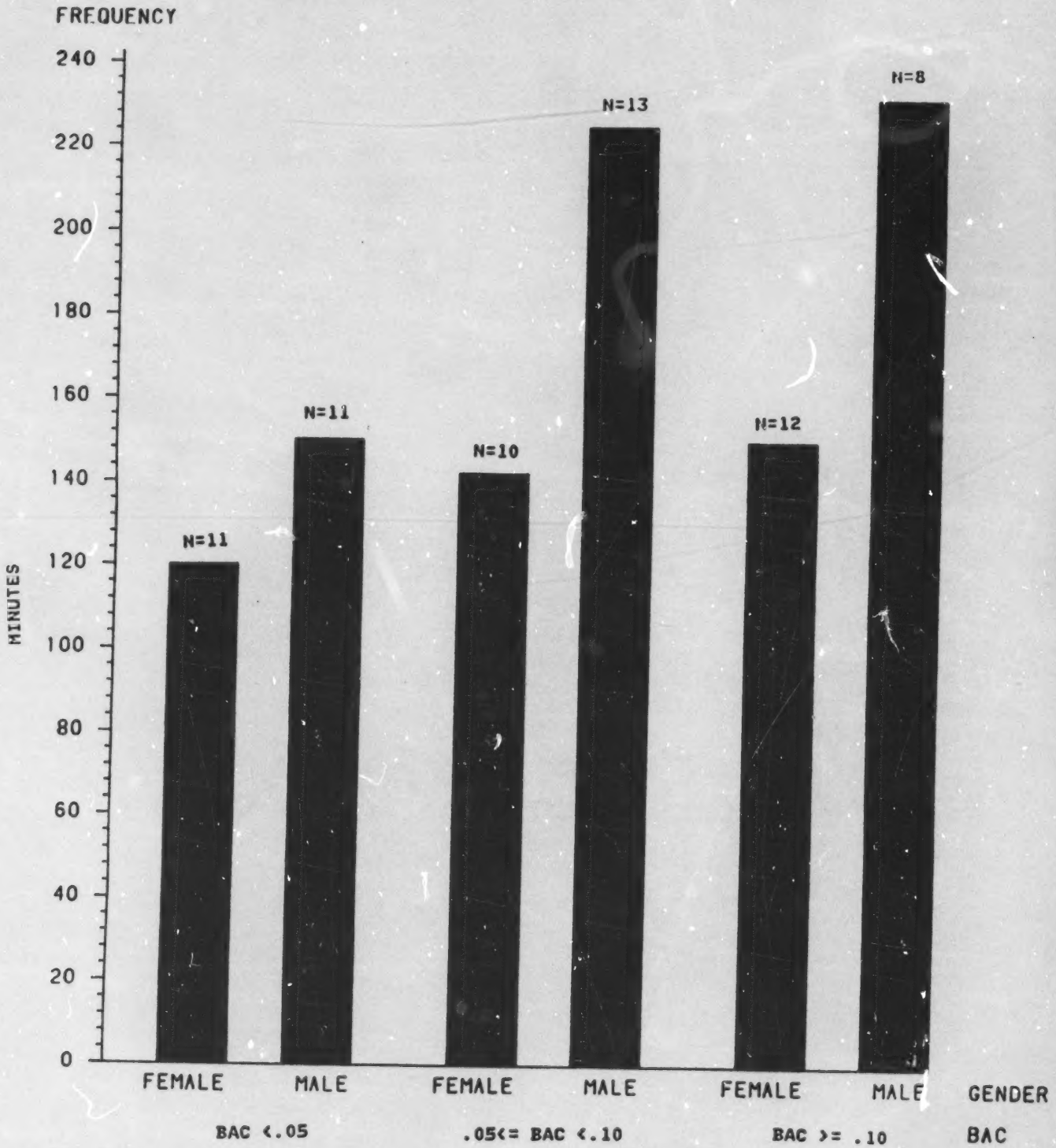
Discussion

Drinking and Driving Experience

To understand this data, it may be useful to create a composite profile based upon the modal response to each item. The typical DUI experience that was related, involved one passenger, usually a male. The driver was driving drunk because there was, in essence, no choice - "everyone else was as drunk or drunker". There were no injuries and no impulsive risk taking, but there was a fairly good chance of an accident. If an accident occurred, it would most likely be a single vehicle accident. There was probably no close call, but if there was, it would probably involve another vehicle. Police would not likely be involved in the DUI episode, and the driver would probably not be arrested. The scenario continues that the driver most likely drank to have a

Figure 14

Mean total time in minutes spent at party for males and females, by BAC.



good time or to get drunk; he was drinking beer; and probably had more than 8 beers over a period of 4 to 5 hours. The drinking also took place at a party in a private home. The drinker would not be described as being more careful than usual, and he would have been on his way home when the critical incident occurred. It is most likely that his passenger(s) had also been drinking, hence they would not have offered to drive. There was no fatality in connection with most critical DUI incidents and there was no mention of another drug taken in combination with alcohol.

It was interesting to note that the scenario adds that the driver probably continued to drive drunk in the future after a critical DUI incident occurred, and his attitude caused him to take more foolish risks. If a passenger was riding with a drunk, the preventive action most frequently prescribed was "offer to drive".

While this scenario obviously simplifies the results, it does offer a composite picture of the circumstances surrounding the typical remembered DUI event. What makes this questionnaire unique, however, is that it generated a wide range of information, encouraging elaboration rather than summary, and the data from this survey illustrated the types of experiences which occur on DUI occasions. It was interesting to find that sober passengers had a moderating effect upon the risk taking of alcohol-impaired drivers. If the passengers were intoxicated, however, they had the opposite effect. The data offered no hint as to why this should be so, but pose an interesting challenge for follow-up study--to compare the effects of a sober audience versus a drinking audience upon risk taking behavior in an intoxicated individual.

Drinking and Driving Advice

This study provided some pertinent insights into the motivational aspects of drinking and subsequent driving among college students. Actually, these

questionnaire results illustrated that social motivation to drink is a complex process. The question "Do you think I should try it?" elicited primarily "yes" responses (n=42) as opposed to "no" (n=8) or "you decide" (n=32), implying active social encouragement of drinking. There seemed to be a reluctance to tell others what they should not do, even when there is potential harm involved. Answers to the "Will anything bad happen to me?" responses were overwhelmingly "yes", as were reactions to Question 8 ("Could I get in trouble?").

While there was a tendency to encourage others to drink, peer pressure was usually not given by the respondents as a factor in their own motivation to drink. The question, "Will I be more popular if I drink?" resulted in almost three times as many "no" responses as "yes" responses. The question, "Will I lose friends if I don't drink?", elicited 47 "no" responses versus only 2 "yes" responses. It was also shown rather convincingly that the motivation to drink is more personal than social. If these responses are valid, this means that by the time a person reaches college, his/her decisions about drinking are relatively autonomous. The implication of this is that s/he is possibly as resistant to messages discouraging drinking as s/he is to the influence of peers encouraging drinking. The same hypothesis may hold for drunk driving behavior also. It would follow, then, that advice, exhortation, and authoritarian dictates are not likely to have an effect in changing the DUI behavior of collegians. A more rational or intellectual appeal is more likely to be effective with college students.

Therefore, future research should focus on further defining the motivational factors underlying college student drinking and driving. Behavioral tests of the hypotheses generated by our pencil and paper techniques would naturally help to validate or invalidate them. These

motivational factors should point the direction to a successful DUI intervention.

Bottled Beer at Student Center

When beer sales were examined across months of the year, a good index of general student beer consumption resulted. These data showed that the beginning of the school year constitutes peak beer consumption. This most likely translates into more drinkers, more drunks, and more alcohol-impaired drivers. Any intervention, then, would require a more intensive effort in the Fall with regard to staff involvement and program publicity. A gradual reduction in personnel through the academic year could then be possible, with the minimum staff requirements occurring in the summer. Naturally, the trend suggested by the data would have to be empirically verified before any fine-tuning of staffing requirements could be accomplished.

Key Person Interviews

These interviews can best be summarized by saying that among those interviewed, DUI in Blacksburg was clearly perceived as a serious problem. The official community would welcome and encourage any intervention which would reduce the incidence of drunk driving among college students. While there were some differences of opinion regarding the exact nature of such an intervention, there seemed to be little resistance to the "drive the drunk home" project proposed to them, and some enthusiastically received such an idea.

Squires Student Center Interviews

Because of the small sample size in this project, it is risky to draw any firm conclusions from the results. The study focused on factors surrounding the drinking of beer from pitchers, factors which determine the amount of beer to be consumed, reasons for drinking, ideas for the discouragement of DUI by

the Student Center, and personal factors related to drinking at the time of the interview. We have already demonstrated that pitchers of beer are strongly associated with significantly higher levels of consumption by individuals (q.v.). The major reasons advanced for drinking from pitchers were convenience and price. Whereas beer in pitchers was cheaper than in other containers at Squires Student Center, it was found that across all bars sampled in Blacksburg, beer in pitchers was the most expensive per ounce. Another advantage offered was that there was less waste with a pitcher, although this does not make logical sense. Logic dictates that the smaller the container the less waste there is likely to be. Alternative pitcher sizes (32 versus 64 ounces) could have appeal for those who may not wish to consume so much as an entire pitcher; and in fact 58% of the present sample was in favor of smaller- sized pitchers.

Among the factors which help to determine amount of beer consumed, the most interesting responses were those which related to social reasons: the number of people around, and how drunk they have to get to relate to the people they are with, etc. These responses are consistent with data from other studies in this project, for example the Drinking and Driving Advice questionnaire (q.v.), which demonstrated that drinking is primarily a social past time. The Drinking and Driving Advice study did show, however, that college students generally deny that peer pressure is a factor in their drinking.

Alcohol Fair

The results of the alcohol fair surveys were encouraging in that 15 of 23 respondents (66%) said that they were willing to volunteer some time for a DUI intervention project in Blacksburg. Encouraging, too, was the finding that these people indicated a willingness to volunteer a mean of 15 hours per

month. While there is often a discrepancy between volunteering and actually participating, these data still indicate that it would be relatively easy to recruit a sufficient number of volunteers to implement a drunk driving intervention project. Naturally, the ease with which a volunteer force could be recruited depends upon such factors as time required, types of tasks required, recruitment procedures, etc.

The project proposed to the subjects of this study was a "third person intervention", which would require the volunteer to attempt to arrange a ride for intoxicated individuals. Such a program would allow the volunteer to participate as the occasion presents itself, and would thus not require a great deal of structured time. An occasional meeting might be sufficient.

As a parallel program, a "drive-the-drunk-home" project would mesh well with the third party intervention. This would entail having some drivers on call to drive intoxicated bar patrons or party-goers home. Volunteers would work in teams, where one volunteer would drive the intoxicated individual home in his/her (the intoxicated individual's) own car, while a second volunteer would follow in another vehicle to drive his partner back to headquarters. This project would require a volunteer staff of approximately 24, and would run initially on weekends (Friday and Saturday). This would allow each team to work one weekend per month and still have a different backup team available each weekend to cover any absentees. With a plan such as this, a potential labor pool as large as the student body of Virginia Tech, and the backing of the official community (see Key Person Interviews), it should not be a difficult intervention to staff.

Drinking Observations

This study has demonstrated several intriguing phenomena related to beer consumption in a college community. Those effects related to container type

were as follows: First, when drinking from a pitcher, as opposed to a glass or bottle, males drank significantly more total ounces of beer than did females, and both males and females drank more total ounces from pitchers than cups or bottles. Second, regardless of container type, males drank at a faster rate than females. Third, females spent more time in the bar when drinking from a pitcher.

Those effects related to group size were as follows: First, subjects drank more when drinking in pairs than when drinking alone, in groups of three, or groups of four or more. Regarding gender effects, both males and females drank less when alone, and females drank most when in dyads, less in groups of three, and still less in groups of four or more. Second, males drank faster than females in all group conditions. Third, females spent more time in the bar than males in all group conditions, but especially in large groups (i.e., four or more).

The fact that males drink more than females, drink faster than females, and spend less time in bars than females could in itself account for the higher rate of DUI among males. It would therefore seem that any DUI intervention should concentrate more on males than females. In fact, on the basis of these results, one might say that to have an impact on drunk driving, one might want to get males to drink less, to drink slower, to spend more time in bars, to avoid purchasing pitchers of beer, and to drink alone. Our field observations have been useful, then, in pointing some general directions for intervention development and research.

A next logical research step would be to manipulate some of the variables observed in this field research, such as time in bar, group size, or container availability, in order to define more precisely the relationships of these factors to drinking. For example, it would be instructive to determine how

much of the impact of container type on drinking behavior (i.e., the most beer consumption from pitchers) is a causal relationship (e.g., the pitcher is convenient and drinkers feel obligated to finish its contents) versus a mere influence of differential intentionality (e.g., those who order pitcher intend to drink more in the first place). Also, it would be interesting to discern what factors are responsible for the fact that females spend more time in the bars than males.

Fraternity Party Drinking Observations

The results of this study suggest that generally, BAC estimation among the population sampled is reasonably accurate, and that most errors in BAC estimation are on the "safe" side. That is, subjects tended to estimate that their BAC was higher than it actually was. In the critical group (BAC $\geq$ .10%), only 7 of 29 subjects underestimated their BAC, and of more significance was the observation that only six drivers left the party with a BAC $\geq$ .10%. In response to the question, "Do you think you are legally drunk?" there were 21 false positives among those who had a BAC $<$ .10% and only 3 false negatives in BAC $\geq$ .10% condition.

These data constitute a rather persuasive argument against the idea that BAC feedback would reduce the incidence of drunk driving, since drinkers already seem to have a fairly accurate idea of their level of alcohol impairment, at least in this university sample. Some might argue that since only six drivers left the party legally drunk, BAC feedback was effective in deterring DUI. The fact is that of those who drove and those who had an actual BAC $\geq$ .10%, only one person thought he was not too drunk to drive prior to receiving BAC feedback. This would imply that for all but one individual, BAC feedback was at best only a confirmation of their subjective estimate of impairment.

It is interesting, however, that when those with a BAC $\geq$ .10% were asked to estimate the number of drinks they had, 60% underestimated the number. But, when this same group was asked to estimate their BAC, only 15% gave an underestimation. One possible explanation for this discrepancy would be that alcohol intoxication hampers memory - especially for information not specifically attended to - but does not affect the current proprioceptive capacity of the drinker, so that s/he is able to gauge rather accurately his/her level of impairment.

Of particular interest was the finding that males tended to spend more time at the party than females, and also spent less time "sobering up." Less "sobering up" time was also associated with higher BAC levels, but a causal relationship cannot be assumed. Additionally, males and females who ended the party with a BAC $\geq$ .10% started drinking much sooner upon arriving at the party than those who ended the party with a BAC < .05%. Thus, information about spacing and pacing drinks may be a DUI strategy worth pursuing among college students, especially if it is aimed at males.

Conclusions and Implications

Drinking and Driving Experience Questionnaire

Risk-taking among drunk drivers was demonstrated in this study to be related to the number of passengers and the degree of alcohol impairment of those passengers. This constitutes evidence for an intervention aimed at the passengers of vehicles driven by alcohol-impaired individuals.

Drinking and Driving Advice Questionnaire

While drinking is typically characterized as a social activity, when the sample was asked questions about why they drink, the answers were overwhelmingly personal -- "I like the taste", etc. Interventions aimed at drinking, and at drinking and driving, might do well to focus on subjective

aspects of drinking -- the hangover, the dehydration, the anxiety associated with DUI arrest,etc., instead of addressing the social conscience of drunk drivers.

Squires Bottled Beer Consumption

High beer consumption months at Virginia Tech are September through January. Any DUI intervention should be intensified during these months. It is not known whether this pattern is applicable to other universities.

Key Person Interviews

The official community in this study was prepared to lend tangible logistical support to a DUI intervention, and where this was not offered, at least no significant obstacles to a community-based intervention were presented. This implies not only that Blacksburg, VA would provide fertile ground for a DUI intervention, but also that small communities in general may be ready for local, large-scale interventions.

Squires Student Center Interviews

Student Center patrons gave primarily personal as opposed to social reasons for drinking. Again, this argues for employing personal reasons in attempting to dissuade drinking and driving.

Alcohol Fair

This study demonstrated that the college campus may be a prime recruiting area for volunteers to intervene actively in preventing DUI problems. The "drive the drunk home" project proposed to attendants of the "alcohol fair" was very well received. Such an intervention could constitute a public service project for a fraternity or perhaps a club formed expressly for DUI intervention like Students Against Drunk Driving (SADD).

Drinking Observations

Men drink more beer than women in bars, they drink faster, and spend less

in the bar than women. Also, both men and women tend to drink more beer when drinking from pitchers. It would be interesting to look at a similar sample as was employed in this study drinking at a bar which had no pitchers of beer available to determine whether pitchers constitute an important influential factor related to heavy beer consumption. Furthermore, it may be useful to employ women as DUI intervention agents since they tend to be more conservative in their drinking.

Fraternity Party Drinking Observations

College students were found to be good estimators of their degree of alcohol impairment, and typically erred on the conservative side, believing that they were more impaired than they really were. Blood alcohol concentration feedback would therefore seem to be extraneous information and need not be a component of a campus DUI intervention. However, it is possible that the presence of the experimenters biased the verbal reactions.

Students with BAC's $\geq$ 10% overwhelmingly underestimated the number of cups of beer they had drunk. If chance alone were operating, one would expect as many overestimations as underestimations. There probably is some psychological mechanism at work, such as denial, which biases the heavy drinkers' estimates in the direction of underestimation. Further exploration of this phenomenon is warranted.

Heavy drinkers spend significantly less time than other drinkers before taking their first drink. This would imply the possibility of using this measure as a predictor of heavy alcohol consumption at a party, and would help to identify potential targets for DUI intervention.

Those with high BAC's tend to spend less "sobering up" time before leaving the party than do other drinkers. Intervention strategies which would expand this period of time would likely pay dividends.

A Community-Based Intervention Plan

The objectives of this exploratory research were: a) to assess drinking and driving attitudes and behaviors among college students at Virginia Polytechnic Institute and State University; b) to assess the availability of local resources for addressing the DUI problem in Blacksburg, Virginia; and c) to develop guidelines for a community-based intervention plan. The study has achieved these objectives, and, in addition, has acquired some archival value in that a law raising the drinking age to 21 may soon become effective. Such a measure could effectively eliminate the college student as an attractive target for alcohol research.

The first two objectives were dealt with in the preceding text. The third objective was briefly addressed in the Alcohol Fair section of this paper (q.v.), and will be discussed at length here. At the outset it should be made clear that the researchers have a bias and this bias certainly influenced some directions in this research. Specifically, if one wants to change the behavior of another person or persons, one must make the desired new behavior the easiest choice for the individual, or at least as easy as it is reasonable. In keeping with this bias it is important to remove as many obstacles as possible from the path of the intoxicated individual who would like to get home without driving. It is felt that a service which would provide transportation for the intoxicated individual at little or no expense, and which would also get his personal vehicle home, would satisfy the criterion of establishing the path of least resistance.

As described above, such an enterprise would entail having a team of volunteers available for driving intoxicated persons home. A call would be placed to the headquarters by the bartender, friend, etc. Two volunteers would go to the drinking site, and one volunteer would drive the drinker home

in the drinker's car. The second volunteer would follow behind in his/her personal car to give the first volunteer a ride back to headquarters. Such a plan eliminates several problems: First, the drinker would get home safely. Second, his/her car also would get home safely. Third, volunteers do not have to carry drinkers in their own cars. Fourth, the method eliminates the stigma which might be associated with the use of a common carrier. [Neighbors would not see a "Drunk" van pull up, and the drinker would have fewer things to explain the next day]. Fifth, the drinker would be reinforced for choosing the safe alternative. The potential liability of having volunteers drive other person's cars would necessitate an insurance policy tailored to meet this need, as would legal advice to forestall as many legal complications as possible.

A large-scale publicity campaign would be required to establish the service in the minds of the populace. It is also anticipated that the service would need to be in place for some time before word-of-mouth would validate it as worthwhile among the citizens of a community. This implies the need for start-up funding of some magnitude, despite the fact that some donated newspaper space and electric media air time can be anticipated.

Also, the potential exists for demand for the service to outstrip supply, especially during peak periods. This could greatly impair the effectiveness of the program as drinkers call for rides and must wait for long periods to be picked up. The present data indicate that the busy part of the year in a college community would be from September to January, and would require increased staffing at that time.

Critique and Directions for Future Research

Given the exploratory nature of the present study, the individual projects varied broadly in an effort to gather as much information about the drinking

behaviors and attitudes of the student population as possible. Some of these studies would profit from a narrowing of focus.

The Drinking and Driving Experience survey yielded some useful data which could be strengthened by replication. This study, and the Drinking and Driving Advice survey both, lend some insight into drinking and DUI motivation, which must ultimately provide the key to impacting the drinking problem which exists among college students.

The interviews at the Alcohol Fair and Squires Student Center suffer from insufficient sample size but potentially could provide instructive data if administered to a larger sample. Also, beer consumption data should be tracked over a longer period of time. Such information could be a sensitive dependent variable for large-scale alcohol interventions.

There were some problems with observing drinking at the fraternity party which need to be addressed in future research of this nature. The fundamental problem is to exert sufficient control over the situation to enable accurate data collection while at the same time remaining unobtrusive enough to not influence the behavior being measured. In the present case, some individuals at the party were observed playing drinking games which made their data impossible to collect. However, to prohibit such activities would be to alter the setting, perhaps significantly. Such data collection could be more valid if taken unobtrusively (hidden video recorder) and categorized at a later time. Short of this measure, the most conservative strategy would be to collect the data as it is found, with the understanding that a large percentage of it will be discarded due to errors.

On the basis of the data collected here, it is safe to say that the college community at Virginia Tech, and the community of Blacksburg, Virginia would be receptive to a community-based DUI intervention. It is strongly

recommended that the next logical research step be a DUI intervention of the type outlined above. Such research would be of tremendous practical and scientific benefit.

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